MECHANICAL HANDLING

INCORPORATING 'MATERIALS HANDLING'

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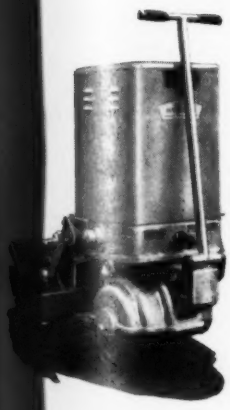

'STEADY AHEAD' SIGNAL

As we go to press the Chancellor of the Exchequer, the Rt. Hon. Heathcoat Amory, has introduced his budget. The title above was used by Mr. Amory when being interviewed on TV and asked how he would describe his budget. We feel it will be agreed by all that the budget is fair to all sections of the community. It is not, as he said, a 'full steam ahead' one, but a 'touch of the accelerator'.

There is no need for us to repeat here the various benefits the budget lays down, but only to try and discuss how the incentives therein can help industry. A few years ago the budget of that time had to deal with inflation. A credit squeeze was imposed and the 'tap was turned off', a bit too hard. Hence, until the autumn of last year, various trades were hindered by lack of capital for the purchase of essential equipment that would enable them to produce more goods at an economic price.

It is to be hoped that the present and future governments will realize that it is easy to 'turn the tap off' but not quite so easy to turn it on again because, in spite of the relaxation of certain restrictions referred to above, there has been, in certain parts of industry, a recession. It can be anticipated that the present budget will enable progress to be made to sell more goods in this country, which is essential if we are to have good overseas markets.

Readers of this journal will be particularly interested in the investment allowances and the allowances for new plant, in addition to the allowances for new mining works.

It is therefore the responsibility of all in industry concerned with the handling of goods or merchandise of any kind, or whether concerned with the production of the mechanical handling equipment, to study their handling costs.

As has been repeatedly stressed in these pages, it is no good having first-class mechanical handling equipment if it is not used sensibly, or if the whole materials handling system has not been properly worked out. There is no excuse now for any lagging behind, production must be increased and costs reduced, and it is to be hoped that the next budget will be a signal for 'full steam ahead'.

SEVENTH MECHANICAL HANDLING EXHIBITION - 1960

The Seventh Mechanical Handling Exhibition (organized by this journal) will be held next year at Earls Court, London, from Tuesday, May 3rd, until Friday, May 13th.

Pour les lecteurs de l'étranger
Für unsere ausländischen Leser
Para los lectores de ultramar

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For readers overseas

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La manutention des matières premières aux aciéries de Ravenscraig page 250
Par un Rédacteur du Journal
Aux nouvelles aciéries de Ravenscraig, en Ecosse, de grosses quantités de matières premières sont manutentionnées par des transporteurs. Au stade actuel de développement, le besoin annuel en matières premières est d'environ 600.000 tonnes de minerai de fer, 400.000 tonnes de houille et 250.000 tonnes d'autres matières.

Un nouvel entrepôt de fromages hollandais page 261
L'emploi de transporteurs et de chariots pour réaliser un système d'entreposage efficace.

L'entreposage de 30.000 articles de modèles différents page 262
Par K. Mumby
Des récipients emboitables, des convoyeurs aériens à câble traînant, avec trolleys à dispositif de simple accrochage et ensembles de groupes de charge grands et petits constituent les bases d'un système grâce auquel l'un des entrepôts de chaussures peut répondre aux besoins de plus de 1.300 succursales, en puisant dans un stock comportant 30.000 modèles différents.

Manutention des produits d'épicerie en vrac, en colis et sous empaquetage page 271
C'est une solution du problème de manutention des charges en vrac et en paquets de dimensions et formes diverses.

Nouvelle grue mobile de 20 tonnes page 275
La gamme des grues mobiles Jones KL vient de s'augmenter du nouveau modèle 12-20, muni de transmission à deux roues et d'une conduite assistée par système hydraulique, avec blocage de la transmission; cette grue sera également disponible avec transmission à quatre roues et en versions montée sur rail et montée sur camion.

Oblitération automatique des lettres postales —2ème Partie page 283
Par G. P. Copping, B.Sc., A.M.I.E.E., P. S. Gerard, B.Sc., A.M.I.E.E., et J. D. Andrews, A.M.I.E.E.
C'est la suite d'un article, dont la première partie a paru dans le numéro d'avril de *Mechanical Handling*, sur les diverses opérations pour la préparation mécanique du courrier pour l'oblitération automatique. Dans ce dernier chapitre, l'auteur décrit la détection du timbre et le système de contrôle électronique.

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INHALTSÜBERSICHT AUF DEUTSCH

Rohmaterialienumschlag im Stahlwerk Ravenscraig Seite 250
Von einem Mitarbeiter
Im neuen Stahlwerk Ravenscraig in Schottland werden grosse Materialmengen auf Förderanlagen transportiert. In seinem gegenwärtigen Entwicklungsstadium beträgt der jährliche Rohmaterialbedarf etwa 600.000 to. Eisenerz, 400.000 to. Kohle und 250.000 to. anderes Material.

Neues holländisches Käselager Seite 261
Anwendung von Fördergeräten und -karren zur Erzielung einer reibungslosen Lagerhaltung.

Lagerhaltung von 30.000 Warensorten Seite 262
Von K. Mumby
Behältersätze, Oberlaufseilförderer mit anklemmbaren Förderwagen sowie grosse und kleine Einheitslastförderer bilden die Grundlage des Systems nach welchem eines der Boots-Lagerhäuser über 1300 Filialen aus dem 30.000 Warensorten enthaltenden Lager versorgt.

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Eine Lösung des Problems der Verladung von Schüttgut und Paketen jeder Grösse und Form.

Neuer 20-to-Mobilkran Seite 275
Die KL-Reihe der Jones-Mobilkrane ist durch das neue Modell 12-20 mit Zweiradantrieb, hydraulischer Servo-Lenkung und Getriebesperre ergänzt worden, das auch mit Vierradantrieb und in schienenfahrbarer bzw. LKW-Ausführung lieferbar sein wird.

Automatische Postabfertigungsanlage Teil 2 Seite 283
Von G. P. Copping, B.Sc., A.M.I.E.E., P. S. Gerard, B.Sc., A.M.I.E.E., und J. D. Andrews, A.M.I.E.E.
Fortsetzung eines Artikels, dessen erster Teil in der April-Nummer von *Mechanical Handling* erschien, über die verschiedenen Vorgänge bei der mechanischen Vorbereitung von Postsendungen für die automatische Abstempelung. In diesem abschliessenden Artikel wird das Abtasten der Briefmarken und das elektronische Steuersystem beschrieben.

Automatische Röhrensteuerung Seite 289
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Artikel über Materialfluss und Förderwesen aus Fachschriften in aller Welt werden in diesem Artikel angeführt und kurz besprochen.

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SUMARIO EN ESPAÑOL

Movimiento de materias primas en las acerías de Ravenscraig Pág. 250
Por un miembro del cuerpo de redactores
En las nuevas Acerías de Ravenscraig, en Escocia, el movimiento de grandes cantidades de materias primas se efectúa por transportadores. En su actual etapa de desarrollo las cantidades aproximadas de materias primas que se consumen anualmente son: 600.000 toneladas de mineral de hierro, 400.000 toneladas de hulla y 250.000 toneladas de otros materiales.

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El uso de transportadores y carretillas para el logro de un sistema eficiente de almacenaje.

Almacenaje de 30.000 renglones Pág. 262
Por K. Mumby
Recipientes encajables, transportadores aéreos de dragalina con troles descolgables, y conjuntos de carga por unidades de grandes y pequeñas dimensiones, constituyen la base del sistema por el cual uno de los almacenes de la organización Boots de productos farmacéuticos y de tocador atiende a las necesidades de más de 1.300 de sus sucursales en existencias de 30.000 artículos diferentes.

Manipuleo de comestibles en cantidades y envasados Pág. 271
Solución del problema del movimiento de cantidades a granel y de envases de varios tamaños y formas.

Nueva grúa móvil de 20 toneladas Pág. 275
Ha sido ampliado el surtido de grúas móviles Jones KL por la adición del nuevo modelo 12-20, con transmisión a dos ruedas y dirección con ayuda de fuerza hidráulica y con inmovilización de la transmisión, la cual estará disponible también con transmisión a las cuatro ruedas y en las formas montada sobre chasis de ferrocarril y sobre camión.

Matasellado automático de cartas Parte 2 Pág. 283
Por G. P. Copping, B.Sc., A.M.I.E.E., P. S. Gerard, B.Sc., A.M.I.E.E., y J. D. Andrews, A.M.I.E.E.
Continuación de un artículo cuya primera parte apareció en el número de Abril de *Mechanical Handling* y que trata de las diversas etapas en la preparación mecánica del correo para el fechado y matasellado automáticos. En esta parte final los autores describen la detección del sello y el sistema de control electrónico.

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RAW MATERIALS HANDLING AT RAVENSCRAIG STEELWORKS

By a Staff Contributor

THE new Ravenscraig steelworks built by Colvilles, Ltd., at Motherwell, Scotland, first came into production in the autumn of 1957. Total cost of the scheme was £24,500,000.

Provision has been made for the expansion of the project —including the installation of a second blast furnace. This expansion scheme is additional to the recently announced proposal to set up a new strip mill with yet further facilities for steelmaking and pig iron production, at Ravenscraig.

At its present stage of development, Ravenscraig requires approximately 600,000 tons of iron ore per annum, together with 400,000 tons of coal and some 250,000 tons of other raw materials. The majority of the conveyors for raw materials handling—other than coal handling—have been supplied and installed by Richard Sutcliffe, Ltd., of Horbury, Wakefield, in their capacity as sub-contractors to three of the main contractors responsible for certain specific sections of the steelworks.

The works is linked by rail with new discharging facilities for ships at Glasgow General Terminus Quay, where imported iron ore is received. At the quay, ore is loaded into special 33-ton capacity bottom-discharge rail wagons for transport direct to Ravenscraig, and also to the Clyde Ironworks.

Ore and Limestone Handling for the Blast Furnace

Incoming trains consisting of bottom-discharge ore wagons are positioned over an ore trough at Ravenscraig, and the contents of the wagons discharged by the operation of a simple hand lever. From the trough, ore is removed for stocking out or for screening by ore bridge crane.

For handling ore and limestone delivered in rail wagons of conventional design, a special conveyor system is installed. A general arrangement drawing of this system is seen in Fig. 4. Incoming materials are discharged by wagon tippler into a bunker, which in turn discharges on to a Hadfield pan feeder (P1) of 12 ft centres × 4 ft 6 in wide (Figs. 1 and 2). This feeds on to the first Sutcliffe belt conveyor, known as C1. With a capacity of 500 tons/hr and a belt width of 48 in, this conveyor has a length of over 435 ft. The conveyor begins horizontally below ground and then is carried in a gantry up a rising incline, giving a vertical lift of 75 ft.

Conveyor C1 raises the incoming material to a pair of super-elevated bunkers (Fig. 3) where the material is discharged either direct into the first bunker or on to a short 48-in wide shuttle conveyor (C2) feeding the second bunker (Fig. 5). From these bunkers the material is gravity fed into 56-ton capacity transfer cars running on two parallel sets of rails.

The rails run along the top of a series of ore bins as seen in Fig. 3, which extend in a straight line from the super-elevated bunkers. In the opposite direction, there extends a series of 12 bins for the storage of sinter materials. These too are served by transfer cars running on a single set of rails linked by means of switch points with the double rail track above the ore bins.

Fig. 1. View of P1 pan feeder which receives ore and limestone from wagon tippler and feeds the material on to C1 conveyor

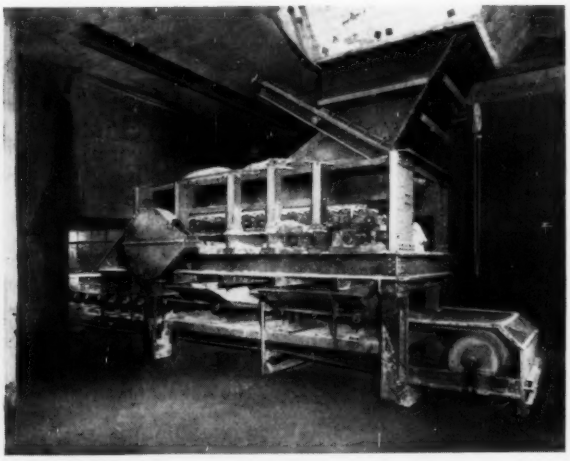

Fig. 2. Another view of P1 pan feeder feeding on to C1 ore and limestone conveyor

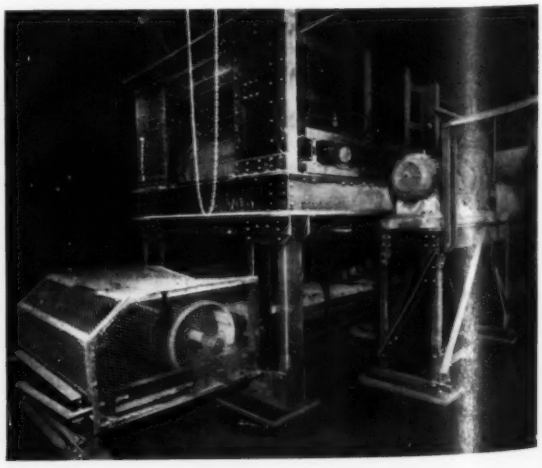

Fig. 3. This picture shows a view of C1 conveyor feeding to the super-elevated bunkers, which are positioned so as to discharge into transfer cars running along the top of the high-line. The rail track in the centre foreground is for transfer cars discharging into the ore trough to the left. On the right of the picture is seen the rail track for the transfer cars discharging into the ore bins. The sinter material storage bins extend in a straight line on the far side of the super-elevated bunkers. On the far left of this picture can be seen part of the stocking-out area

The entire complex of ore bins and sinter materials bins, served by the high-level transfer cars, is known within the works as the 'high-line' (See Fig. 6). Also built into the high-line, interrupting the series of ore bins at two points, are two sets of coke bunkers and breeze bunkers, one set for the present blast furnace and the other for use when the second blast furnace is installed (Fig. 16). Equipment provided for handling the coke is described later in this article.

Transfer cars travelling on one of the double rail tracks serve direct into the ore bins. Cars on the second of the double rail tracks discharge into the ore trough, previously mentioned, which runs alongside the ore bins.

Below the ore bins, scale cars are provided to draw off the required amounts of material and discharge them into the blast furnace skip hoist.

Raw Materials Reclamation

Ore and limestone from the stockyard, or direct from the ore trough, is reclaimed into the transfer cars by means of the ore bridge crane. The transfer cars discharge the ore into a reclaiming hopper which deposits it on to a Hadfield pan feeder (P2) at 10 ft centres × 4 ft 6 in wide (Fig. 7). This controls the rate of feed on to a 440 ft long belt conveyor C3 (Fig. 8), which raises the material some 106 ft to the screen house built at the end of the 'high-line'. Three G.E.C. Gyrex single-deck screens (S4, S5 and S6) are provided to afford four segregated sizes of material, as follows; + 1¾ in; ½ in to 1¾ in; ¼ in to ½ in and − ¼ in. The screen sizes are as given below.

S4—72 in wide × 192 in long, with 1¾-in square mesh.
S5—72 in wide × 168 in long, with ½-in square mesh.
S6—72 in wide × 168 in long, with ¼-in square mesh.

Oversize material from the first two screens falls direct into two separate bunkers. Undersize material from screen S4 (Fig. 9) falls on to a belt conveyor C4, which takes it to screen S5. From this screen the undersize material falls on to conveyor C5, which takes it to screen S6. This screen discharges oversize material to belt C6, which feeds the third bunker, while undersize material drops into the fourth bunker.

Screened ore is withdrawn from the bunkers and taken to the ore bins by transfer car. Fines from the screen house (i.e. the − ¼ in material) are taken similarly by transfer car to the sinter material bins (which can be seen in Fig. 8), ready for sinter-making.

The 'high-line' as described above was erected by the Motherwell Bridge & Engineering Co., Ltd., to their final design, based on rough schemes provided by the main contractors, Ashmore, Benson, Pease & Co., who also supplied the ore bridge crane, and to whom Richard Sutcliffe, Ltd., were sub-contractors for the conveyors and the screen house.

Coke Handling

The coke oven plant, with its associated coal handling, storage and blending plant, was supplied and installed by Woodall Duckham Construction Co., Ltd. The coking coal is discharged from rail wagons by means of a separate

wagon tippler, and conveyed by a series of belt conveyors, through the blending and crushing operations and to the coke-oven service bunker.

From the coke oven, the coke is conveyed to a coke screen house, and, after screening, is discharged on to a 533 ft long belt conveyor (No. 8) which forms the first stage of a series of coke and breeze handling equipment supplied by Ashmore, Benson Pease & Co., for which the conveyors were supplied under sub-contract by Richard Sutcliffe, Ltd.

Conveyor No. 8 is carried in a gantry and runs from the screen house to the 'high-line' (Figs 4, 10 and 11). Here the coke is transferred on to a short reversible belt conveyor (No. 9) which enables the material to be fed either to No. 10 coke conveyor (Fig. 14) taking material to the ore trough ready for stocking out by ore bridge crane, or on to No. 11 conveyor which runs along the top of the 'high-line', parallel with the transfer car rails (Figs. 12 and 13). This conveyor is equipped with a tripper (Fig. 15) for discharging the coke into the coke bunkers which, as previously described, are built in-line with the ore bins, as seen in Fig. 16.

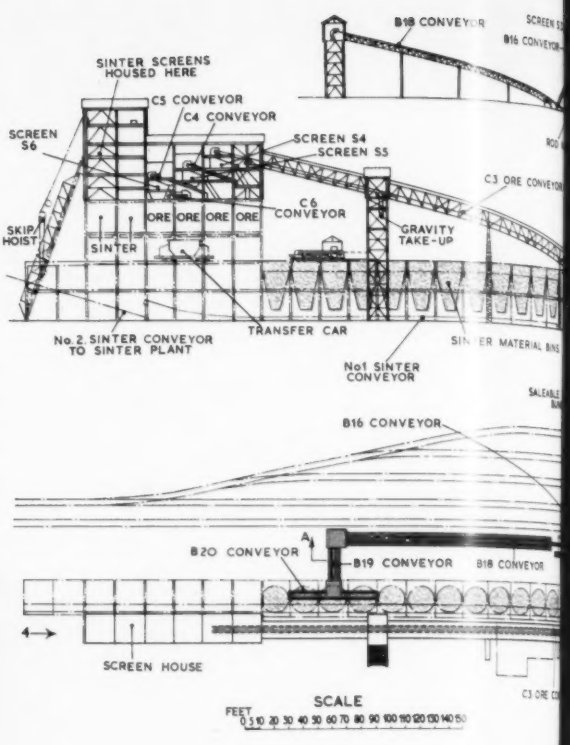

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Fig. 4. General arrangement of ore and cake-handling systems

Fig. 5. View of C2 shuttle conveyor serving the super-elevated bunkers

Fig. 6. A view of part of the 'high-line' showing ore bins on left and super-elevated bunkers positioned over the ore bins in the background

Fig. 7. Reclaim hopper and P2 reclaim feeder discharging on to belt conveyor C3

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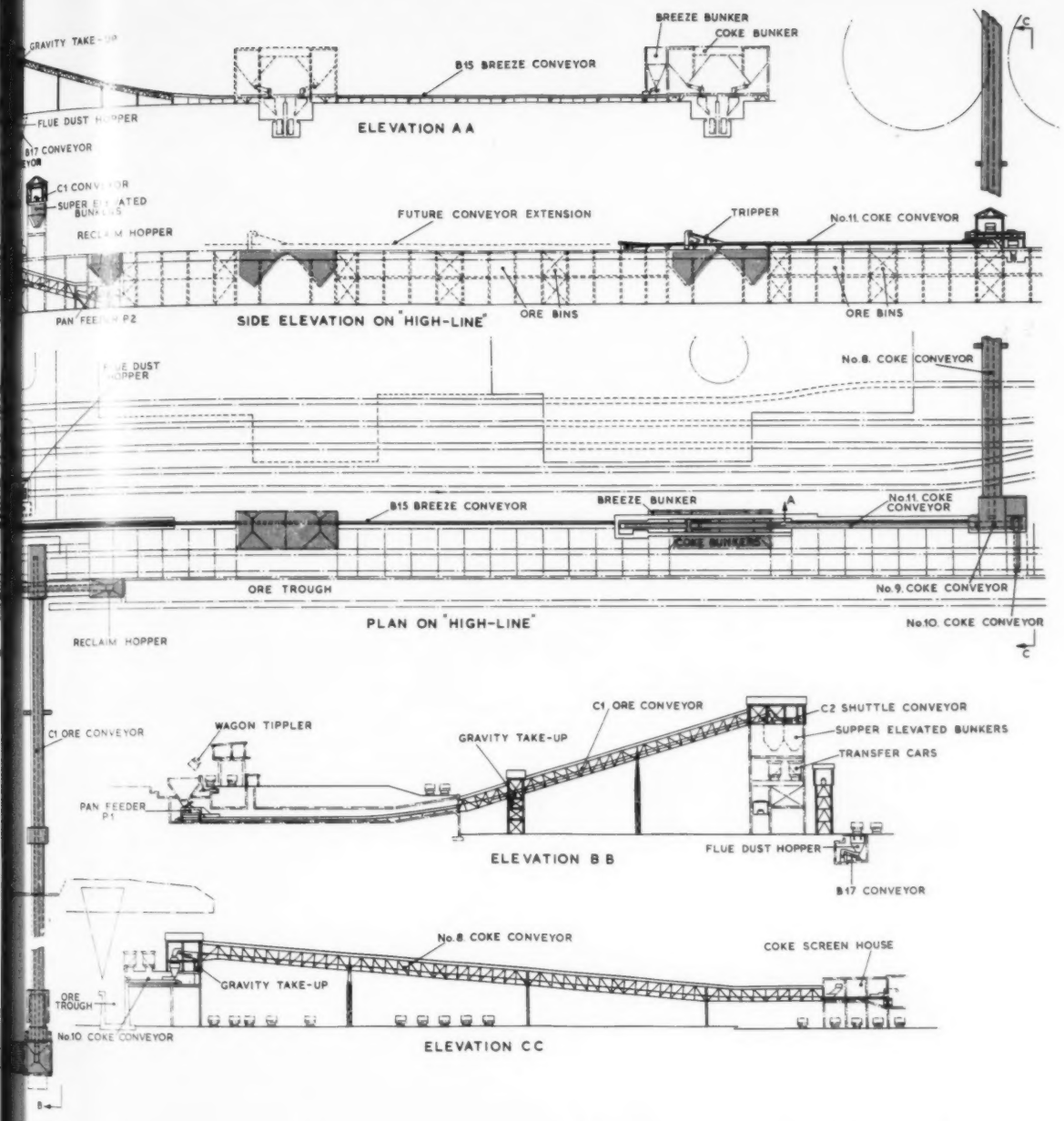
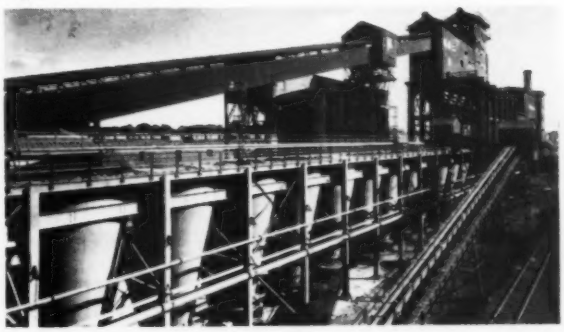


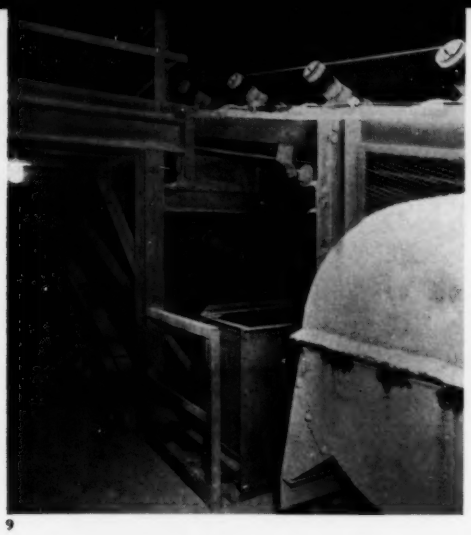
From the coke bunkers, material is drawn off by two screens which feed the skip hoist serving the blast furnace.

Coke breeze is likewise conveyed via conveyors Nos. 8, 9 and 11, to the breeze bunker adjacent to the coke bunkers. From here, material is fed on to a belt conveyor (B15) which also receives the fines (-1 in) from the screens beneath the coke bunker. This conveyor is a 640-ft long, 24-in wide belt conveyor which, after proceeding horizontally at ground level for some 328 ft, rises to give a vertical lift of 45 ft during the final part of its length (Fig. 17).

Conveyor B15 feeds to a small elevated screen house (Fig. 18) where a screen, S3, (Fig. 19) separates the $+\frac{1}{2}$-in from the $-\frac{1}{2}$-in breeze. This is a Gyrex single-deck screen, size 60 in × 168 in, with $\frac{1}{2}$ in square mesh. The $+\frac{1}{2}$-in material is saleable breeze and is conveyed by a further belt conveyor, B16, to an adjacent 5-ton bunker, seen in Fig. 17, from which it can be discharged direct into road or rail vehicles.

Fig. 8. Conveyor C3 rises above the sinter material storage bins to the ore limestone screen house seen in right background





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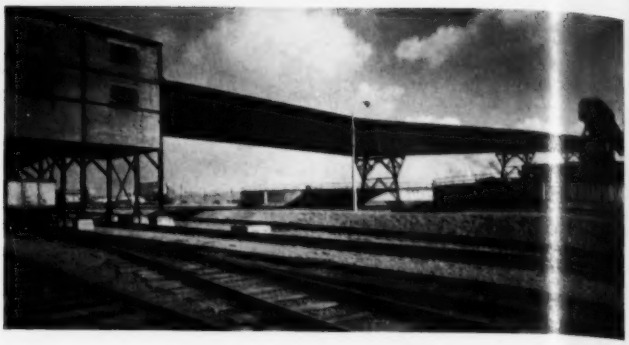

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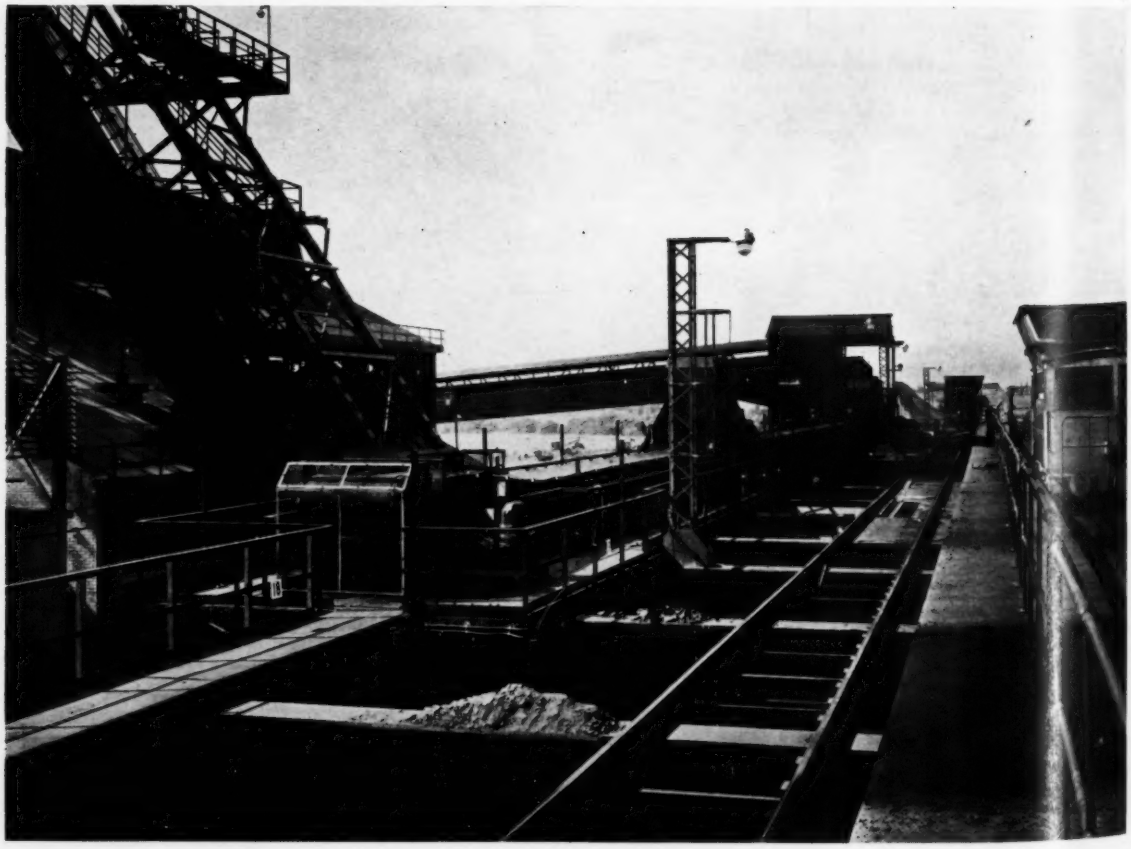

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Fig. 9. Inside the screen house; showing head of conveyor C3 and screen S4

Fig. 10. View showing coke screen house on left with conveyors No. 8 taking the coke from the screen house to the top of the 'high-line'

Fig. 11. View along No. 8 coke conveyor

Fig. 12. This picture shows No. 8 coke conveyor entering junction house on left, and on right, the No. 11 coke conveyor running above the ore bins

Fig. 13. Another view of the top of the 'high-line' showing transfer car on right and blast furnace skip hoist on left. In background is seen No. 8 coke conveyor entering the junction house. Left centre is the drive head of No. 11 coke conveyor, the tripper being hidden behind the lamp standard in centre of picture

Fig. 14. View of No. 10 coke conveyor taking material from No. 9 conveyor to the ore trough in background.

Fig. 15. View showing tripper on No. 11 coke conveyor (See also Fig. 13)

Fig. 16. In this view of the 'high-line' can be seen the coke bunkers (centre) which will come into service when the second blast furnace is built. An identical set of bunkers is already in use for the first blast furnace

Fig. 17. In the left foreground is seen B15 breeze conveyor rising to the small elevated screen house (centre). From the screen house conveyor B16 can be seen, borne on a lattice-type gantry, feeding into a bunker house positioned above the rail track (right). The superelevated ore and limestone bunkers feeding into two transfer cars can also be seen in this picture (left centre)

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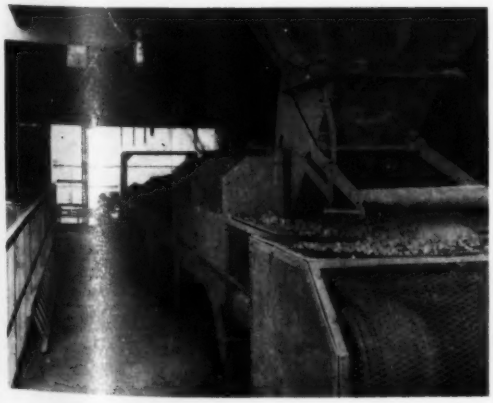

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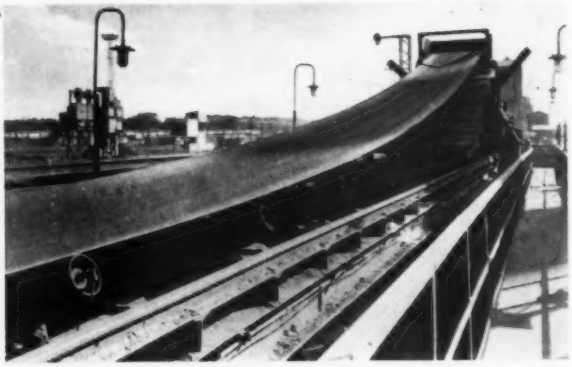

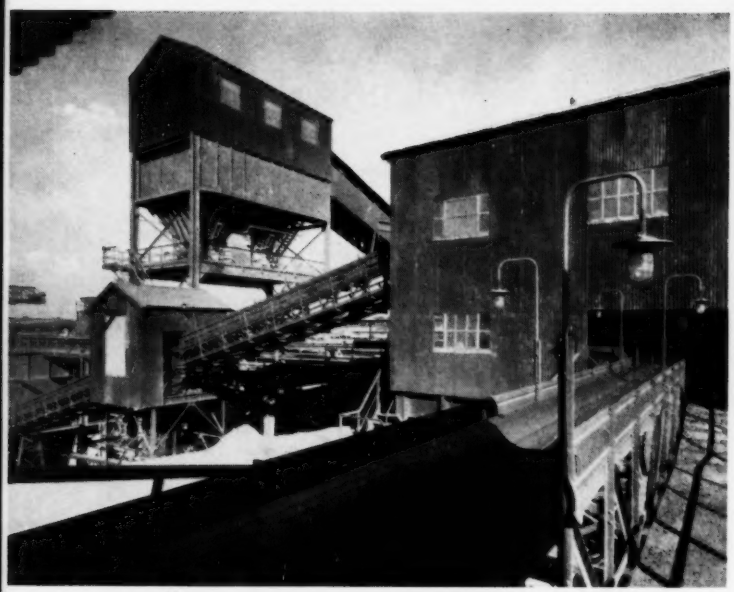

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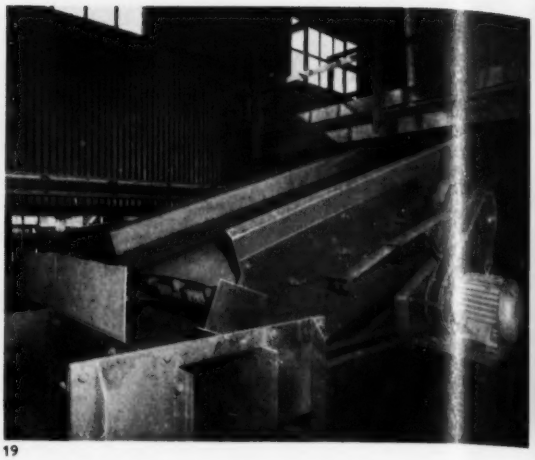
Fig. 18. A view along B16 conveyor for saleable breeze, looking in the direction of the feed and within the screen house. On the left, conveyor B15 can be seen rising to the screen house via a gravity take-up tower

Fig. 19. View inside the screen house showing screen S3 feeding on to conveyor B16

Fig. 20. The rod mill is seen in the lower foreground, with conveyor B18 rising from it to a junction house where it discharges to conveyor B19



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The $-\frac{1}{8}$ in material falls into a separate bunker from where it is drawn off by a Sherwen vibrating feeder into a rod mill, (Fig. 20) which prepares it for sinter-making. The material is conveyed from the rod mill to the sinter plant on a 24-in wide belt conveyor (B 18). This conveyor rises from below ground level to a lift height of 65 ft over a conveyor length of 290 ft, as seen in Fig. 20. It discharges, via a 40-ft long belt conveyor, B19, on to a reversible shuttle conveyor, B20, (Fig. 21) which feeds the material into any one of three sinter material storage bins.

Flue dust, also used for sinter making, is brought from the blast furnace in rail trucks and discharged into a gridded

20

21

Fig. 21. Conveyor B19 rises on left to shuttle conveyor B20 which feeds breeze fines to any one of three different bins ready for sinter-making

Fig. 22. Rotary table feeders at outlets of sinter material storage bins, feed as shown here on to No. 1 sinter conveyor

Fig. 23. No. 3 sinter conveyor feeding in to sinter machine in background

Fig. 24. Sinter-fines collection chutes from sinter machine, discharging on to No. 4 sinter conveyor

hopper, from which the material is drawn off by a 48-in wide belt feeder, B17. This feeder conveyor delivers the flue dust on to conveyor B18, for delivery as described above to the sinter material bins.

Sinter Plant

The remaining nine sinter material storage bins are used for the storage of ore fines from the main screen house, as previously described. Rotary table feeders are provided at the outlets of each bin, and these feed the raw materials for sinter making on to a 316-ft long belt conveyor (known as No. 1 Sinter) (Fig. 22). The conveyor has a vertical lift of 11 ft and discharges, in turn, on to No. 2 sinter conveyor which has a lift of 93 ft and feeds into the sinter plant receiving hopper. The hopper discharges to two drum mixers from which the material is fed on to No. 3 sinter plant conveyor (Fig. 23) giving a direct feed into the sinter machine.

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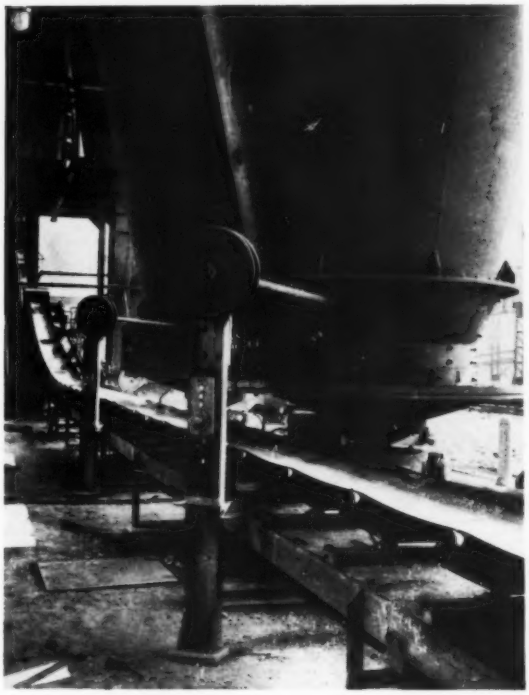

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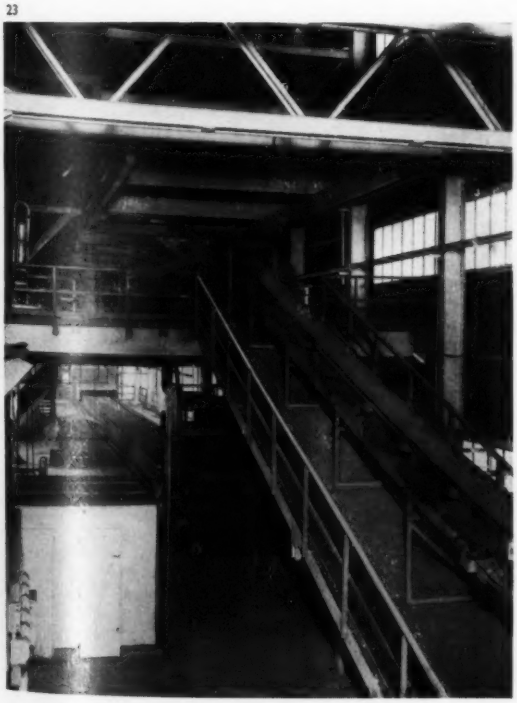

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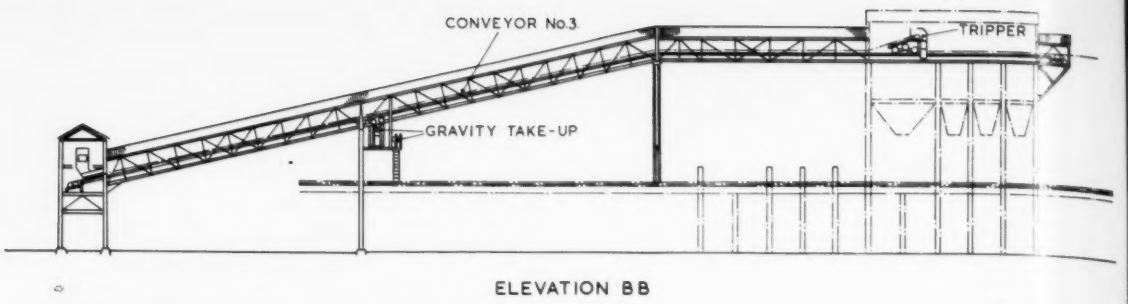
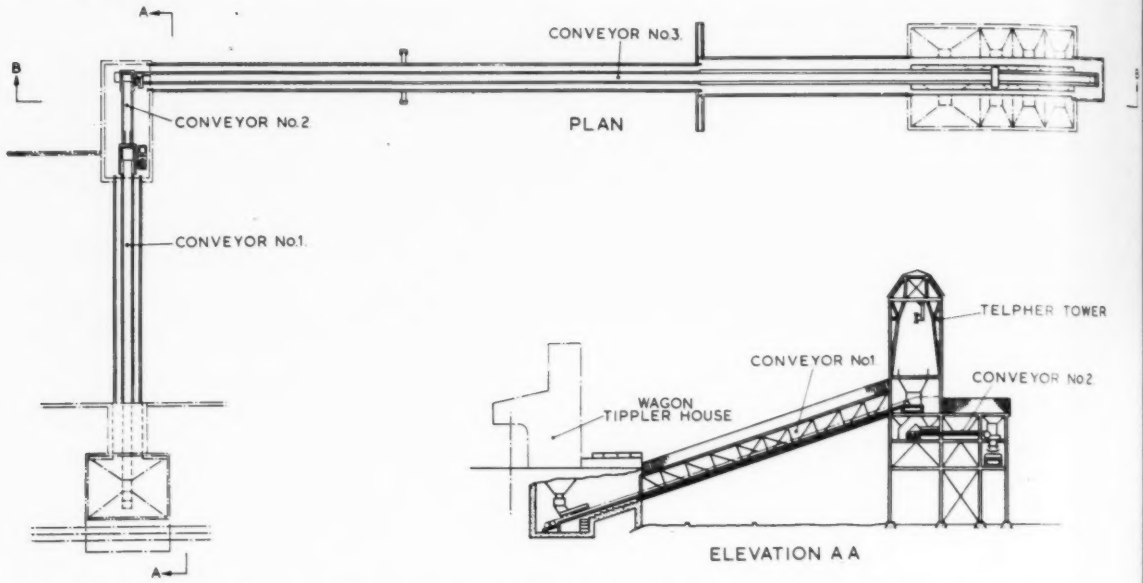


Fig. 25. General arrangement of limestone-handling system for the melting shop



Sinter is discharged from the machine direct into a double skip-hoist which raises it to a two-roll screen positioned in a chute in the main ore-screen house. From the roll screen, the oversize material falls into a sinter bunker and the undersize sinter on to a further 60-in × 168-in single deck Gyrex screen. This segregates the fines ($-\frac{1}{4}$ in) which are dropped into a returned fines bunker, the oversize material being again discharged into the first sinter bunker.

From the bunkers, the sinter and return fines are moved by transfer car to the respective 'high-line' and sinter material storage bins.

Fines falling direct from the sinter machine are carried on a belt conveyor (No. 4 Sinter) beneath the machine as shown in Fig. 24, and are conveyed to the skip hoist, where they are raised and treated as sinter.

The whole of the sinter plant was supplied by Head Wrightson Iron & Steelworks Engineering, Ltd., the four belt conveyors being supplied and installed under sub-contract by Richard Sutcliffe, Ltd. The sinter plant skip-hoist was supplied by The New Conveyor Co., Ltd.

Melting Shop

The melting shop at Ravenscraig has a rated total output of 400,000 tons of steel per annum. Hot metal from the blast furnace is taken to the melting shop by 75-ton ladles (Ashmore, Benson, Pease & Co., Ltd.). Limestone for use in the melting shop is received at the works in rail wagons and is discharged into a handling system supplied by Strachan & Henshaw, Ltd., for which the belt conveyors were designed and installed, under sub-contract, by Richard Sutcliffe, Ltd. A general arrangement drawing of this system is given in Fig. 25.

The limestone is discharged from the rail wagons into a bunker by means of a wagon tippler. The bunker is equipped with vibratory feeders (Fig. 26) which deposit the material on to a 124-ft inclined belt conveyor (No. 1 Limestone). This raises the material to a tower constructed

Fig. 26. Vibrating feeders beneath Strachan & Henshaw wagon tippler feed limestone for melting shop on to conveyor No. 1

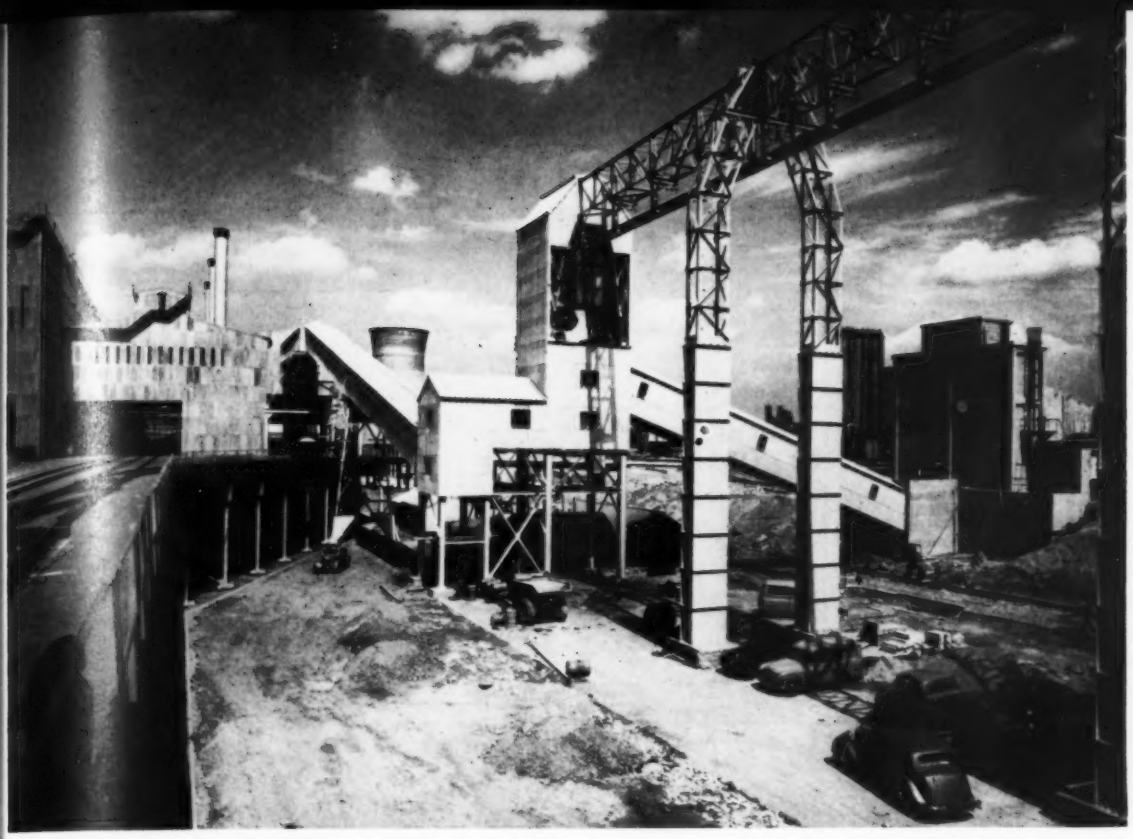


Fig. 27. General view of limestone handling system for melting shop, showing telpher and conveyor gantries for No. 1 and No. 3 limestone conveyors

as one leg of a telpher, as seen in Fig. 27. Within the tower, material can either be discharged on to a second belt conveyor (No. 2), or else, via a chute, into the stockyard spanned by the telpher, the latter being used to reclaim material back on to No. 2 limestone conveyor when required from stock.

No. 2 limestone conveyor is a short conveyor feeding on to No. 3 limestone conveyor which is a 320-ft long belt conveyor inclined so as to give a vertical lift of 40 ft, which, with the 40 ft of lift provided by conveyor No. 1, gives a discharge height of 80 ft above ground level. After climbing for just over half its length, the belt conveyor levels out to the horizontal where it runs across the top of a series of limestone bins. (Figs. 28 and 29.) A belt-operated travelling tripper discharges the material into the bins, ready for use in the melting shop.

Belt Conveyor Construction

Principal details of the Sutcliffe belt conveyors at Ravenscraig are given in tabular form in Table 1. Sutcliffe's rubber disc-type return idlers (Fig. 30) are fitted to minimize abrasion, and a safety pull-wire system is fitted throughout, enabling each conveyor system to be shut down from any point along its length in case of emergency. Cast-iron, in-line troughing idlers are fitted, provided with grease nipple and pipe lubrication.

All the conveyor drums are rubber covered to give resistance to abrasion. The belts themselves were supplied by Goodyear, and are all of Grade A quality, the 48-in wide belts being of 6-ply or 7-ply construction, and the 24- and 36-in wide belts of 5-ply construction.

The trippers on No. 11 coke conveyor and No. 3 melting shop conveyor are both of the belt-operated type, with a lever for manual reversing if required. Striking plates are fitted to make the trippers self-reversing in normal use.

Fig. 28. View of No. 3 limestone conveyor running along top of melting-shop limestone bins, with tripper in background

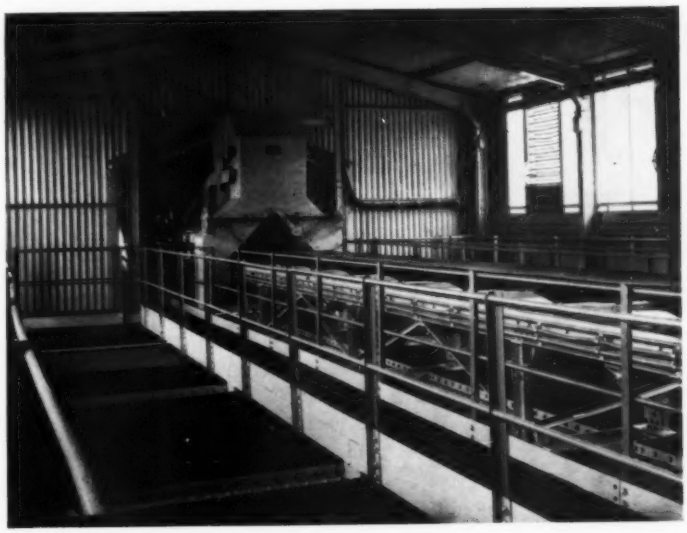


Table 1. Details of Sutcliffe Belt Conveyors

MAIN ORE AND LIMESTONE PLANT

Main Contractors: Ashmore, Benson, Pease & Co.

Conveyor	Material	Capacity ton/hr	Belt width in	Length ft	Lift ft	Belt Speed f.p.m.	Drive drum dia in	Motor h.p.	Remarks
C.1	Ore & Limestone	500	48	435	75	300	2 × 30	75	Fluid Coupling Gravity Take-up
C.2 (Shuttle)	Ore & Limestone	500	48	13	—	300	24	7½	
C.3	Ore & Limestone	500	48	440	106	300	2 × 30	100	Gravity Take-up
C.4	Ore & Limestone	500	48	35	10	300	24	17½	
C.5	Ore & Limestone	500	48	42	12	300	24	17½	
C.6	Ore & Limestone	500	48	12	—	300	20	10	
No. 8	Coke	200	48	533	30	200	2 × 30	35	Gravity Take-up. Fluid Coupling
No. 9	Coke	200	48	28	—	200	24	7½	Reversible
No. 10	Coke	200	48	40	—	200	24	7½	
No. 11	Coke	200	48	266	—	200	2 × 30	35	Tripper
B.15	Coke Breeze	60	24	640	45	200	2 × 24	17½	Gravity Take-up
B.16	Coke Breeze	40	24	58	—	200	24	5	
B.17 (Belt Feeder)	Flue Dust	40	48	12	5	35	24	5	
B.18	Coke Breeze & Flue Dust	40	24	290	65	200	24	10	
B.19	Coke Breeze & Flue Dust	40	24	40	8	200	24	5	
B.20 (Shuttle)	Coke Breeze & Flue Dust	40	24	28	—	200	24	5	Reversible
LIMESTONE CONVEYORS FOR MELTING SHOP									
Main Contractors: Strachan & Henshaw, Ltd.									
No. 1	Limestone	250	36	124	40	200	24	25	Fluid Coupling
No. 2	Limestone	100	36	22 ft 9 in	—	200	24	7½	
No. 3	Limestone	100	36	320	40	200	24	15	Tripper Gravity Take-up
SINTER PLANT CONVEYORS									
Main Contractors: Head Wrightson Iron & Steelworks Engineering, Ltd.									
No. 1	Sinter	250	24	316	11	300	24	15	
No. 2	Sinter	250	24	318	93	300	24	45	Gravity Take-up
No. 3	Sinter	250	24	98	18	300	24	15	
No. 4	Sinter Dust	10	24	182	18	150	24	5	

Each conveyor system is centrally controlled and sequence interlocked.

Gravity take-ups are provided on several of the conveyors, as indicated in Table 1, and as can be seen from the drawings. One of the take-up towers is shown in Fig. 18. Robertson's protected metal is used for the sheeting of the gantries and junction houses.

Fielden Tektor level control units are fitted in the two super-elevated bunkers beneath conveyor C2 (ore and limestone) and also in the three coke breeze bunkers beneath B20 shuttle conveyor. These give both audible and visible warnings when there is any danger of the bunkers being over-filled.

Acknowledgment

We are indebted to the directors of Colvilles, Ltd., for the facilities placed at our disposal for the inspection of the equipment described in this article.

Fig. 29. Another view of the belt-operated tripper on No. 3 limestone conveyor

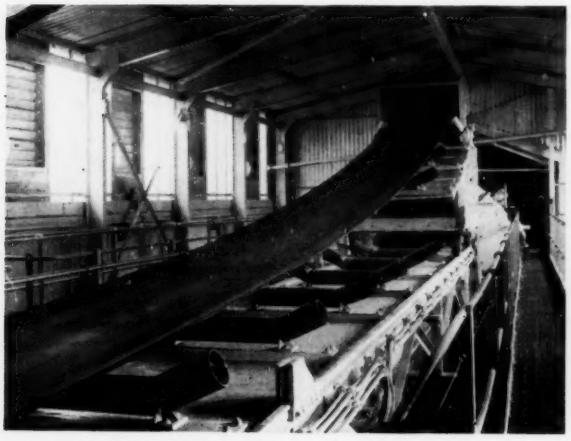
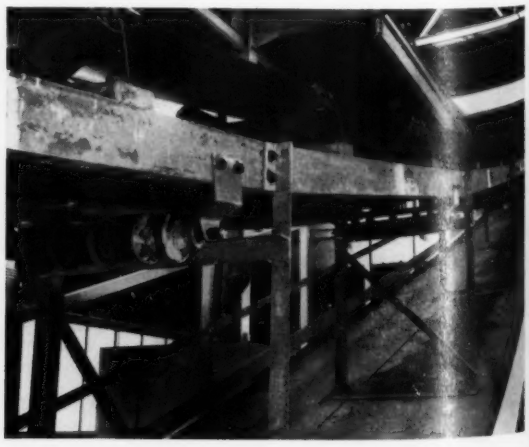


Fig. 30. This close-up of No. 3 sinter conveyor illustrates the use of the rubber disc return idlers and the pipe-lubrication of the troughing idlers.



NEW DUTCH CHEESE STORE

Steel band conveyors deliver goods to storage racks

CLAIMED to be Europe's largest and most up-to-date cheese store, a new warehouse has recently been placed in service by the dairy co-operative concern 'De Producent' at Gouda, Holland. It is capable of storing 1,800,000 kg. of cheeses on its 72,000 m length of shelving.

Completely insulated from the outside atmosphere, the new warehouse is provided with an efficient air circulation and air-conditioning system which controls temperature, moisture-content and pressure, enabling any conceivable variation in climatic conditions to be tolerated. Perforated floors and ceilings are used to facilitate air circulation.

Corrosion-proof Steel Conveyors

In seeking a solution to the internal transportation problem, a system of longitudinal and transverse corrosion-proof steel conveyor bands has been adopted with a total length of more than 3,000 m, whereby the cheeses can be delivered efficiently and smoothly to the storage racks.

Three large vans, delivering 12,000 kg of cheese to the warehouse, can be discharged simultaneously. Each truck is off-loaded on to a band conveyor at a rate of 10 tons of cheese an hour, giving a total aggregate discharge of 30 tons/hr. These bands can be controlled to serve any of 14 further conveyor bands, running at right angles to the main discharge conveyors, and delivering down the passage-ways to the different tiers of cheese racks. This system makes it possible for three men to deal with 10 tons of cheese per hour, for which throughput eight men were previously necessary. This is equivalent to a saving of 60 per cent in man-power.

By weighing before and after discharge the quantity of cheese is accurately determined, while the number of cheeses handled is recorded by a mechanism mounted over the belt conveyor.

After remaining to ripen for several weeks in the new warehouse, the cheeses are again transported by the same conveyor system to three bands which, in turn, deliver to the despatch area. Here the cheeses are off-loaded from the conveyors on to pallets which are transported within this area by means of a Clark fork-lift truck. After being washed, wrapped and paraffined the cheeses are packed for despatch.

General view of the longitudinal and transverse band conveyor system

The despatch area

Panel from which the band conveyors are controlled

Nesting containers, overhead conveyors propelling detachable trolleys, and major and minor unit-load assemblies, are the basis of the system by which one of the Boots warehouses supplies the demands of the 1,300 branches from a stock of 30,000 different items.

WAREHOUSING 30,000 LINES

By K. MUMBY

THIS ARTICLE is concerned with the Island Street warehouse of Boots Pure Drug Co., Ltd., in Nottingham, which, with other warehouses in the Nottingham area and at Stamford Street, London, Heywood in Lancashire, and Airdrie in Scotland, supplies the needs of 1,313 retail shops from stock worth from £3,500,000 to £3,750,000. The Island Street warehouse is one of the largest among them and the one with the most complex and difficult task to perform, for the 1,300 branches are supplied from an inventory of no fewer than 30,000 different items and the goods are stored in a five-storey building that occupies a mere 5,000 sq. ft. of ground.

Some suggestion of the vast scale of the Boots organization is indicated by the fact that approximately 25 per cent of all retail sales represent goods produced in the company's own factories: chemicals from the factory at Island Street adjacent to the warehouse, antibiotics from Daleside Road, pharmaceuticals from Beeston, near Nottingham, and other manufactured goods from the new factory at Airdrie, near Glasgow, where they deal with the overflow of orders on Beeston and specialize in long runs and mechanized packaging. There is also a huge printing works at Nottingham which acts largely as a service organization supplying the needs of the various departments for stationery and printed wrapping materials, but partly also as a producer of finished goods, such as diaries and customers' notepaper. And behind all manufacture is the work of numerous research laboratories and a complex administrative structure.

Beeston, on a site of 264 acres, is closely related geographically and functionally to the Island Street warehouse. When it was built, 20 years ago, it was years ahead of its time, and the phase of modernization and reconstruction now in progress there will bring about many interesting developments in the materials handling sphere.

Island Street is the site of the small factory opened by Jesse Boot in 1888. As it and the warehousing function were extended, adjacent buildings were acquired. During the course of these phases of expansion an old lace factory was brought into use to provide additional warehousing accommodation and when, in 1955, the new warehouse was built to replace premises lost through war damage, the new construction had to be accommodated to the old.

Hence the multi-storey layout illustrated by our artist in Fig. 7. At each of the five upper floors the new building has had to be tied to the old. In this framework, Boots have built a warehouse of exemplary functional efficiency, in which the best continental and American practices have been adapted and amplified to suit their own exacting requirements.

BELOW
Fig. 1. Goods arriving at Boots Island Street warehouse are unloaded on to stillages for transportation to bulk-storage areas

LEFT
Fig. 2. Whenever possible, stock is stored on the stillages on to which it was unloaded

3

Fig. 3. When orders are assembled, bulk stock is transferred to stillages handled by means of low-lift hand trucks

4

Fig. 4. Small hand trucks of this type, with pedal-operated lifting mechanism, are used extensively for transporting stillages on the warehouse floor

Fig. 5. Orders for miscellaneous stock are assembled in wooden containers on trolleys pushed by hand among the stillages and storage bins

6

Fig. 6. The tubular steel trolleys are light in weight and extremely easy to handle

5

Function of the New Warehouse

In discharging its function as a warehousing and distributing organization for receiving and storing the incoming stock and assembling and despatching goods to the branches, the Island Street warehouse handles an annual throughput of 25,000 tons.

Fig. 7. Our artist's impression of the warehousing arrangements employed by Boots Pure Drug Co., Ltd., at Island Street, Nottingham. The drawing shows incoming bulk and reserve stock (1), palletized on arrival, transported in the appropriate storage areas on pallet and stillage trucks (2); orders assembled in containers carried on lightweight tubular trolleys (3); packing tables (4); trucks propelled by overhead conveyors (5) on the first and second floors, which carry goods to the areas in which they are grouped according to destination, are then detached to set down their loads, and returned empty (7) to complete the circuit

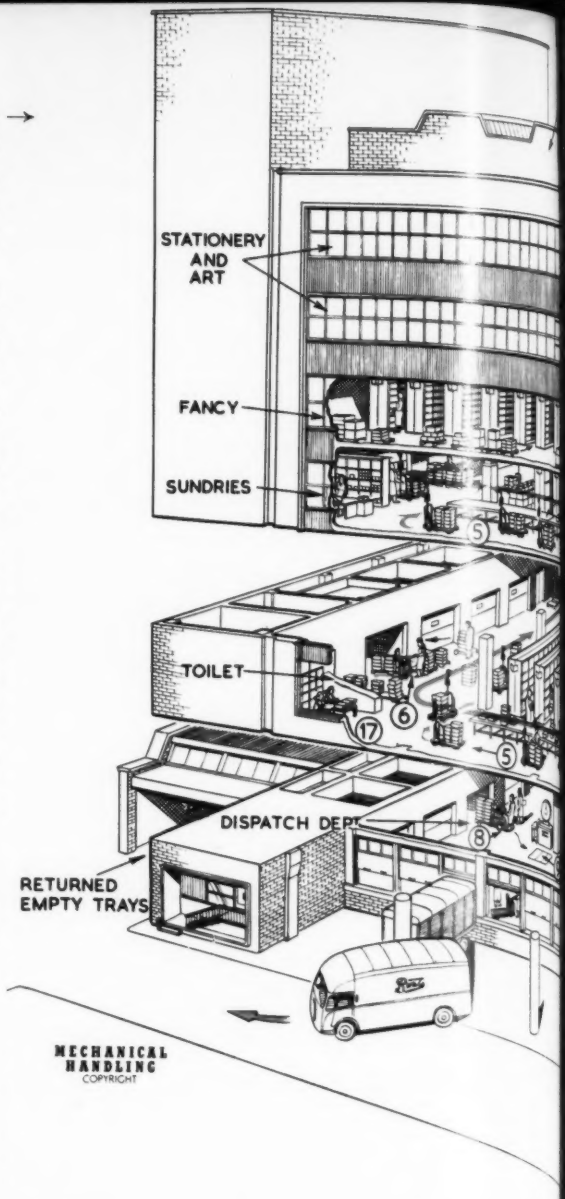
Stillage-loads called for by the despatch department are taken to the lifts by pedestrian-operated pallet trucks (6) and transferred from lift to weighbridge (9) and assembly area (10) by rider-operated trucks (8). Other reference figures denote empty nesting containers stacked ready for use (14), despatch office (11), transport office (12), lift from maintenance department to despatch (13), gravity roller conveyor (16), scrutineers (17), and buffets (15) installed in each department

A section of each storage department is devoted to the assembly of special orders (A), which are packed and stamped for postage on the ground floor (B). Goods destined for each customer are grouped together on a collecting table (C), passed to packers (D), and wrappers (E), and transported on conveyors (F) moving in opposite directions towards the weighing and stamping table (G). Packages for the London area are delivered by firm's transport (I) and others by G.P.O. van (H)

The stillages were made to Boots design by Fisher & Ludlow, Ltd., Birmingham, M.G.K. Engineering Co., Ltd., Birmingham, and Rubery Owen & Co., Ltd., Wrexham, and the nesting containers are of Boots design and manufacture. The tubular hand-trolleys on which they are transported in the storage area, and also the hand-lift platform trucks used for general duties, were made by Geest Industries, Ltd., Spalding, to Boots specification. Sovex, Ltd., Erith, were responsible for the conveyor-propelled truck systems on the first and second floors, the overhead conveyors being Sovex products while the elevating platform trucks were manufactured by Eccles (Birmingham), Ltd., to Boots and Sovex specification

Storage bins are standard products of Chatwood-Milner, Ltd., and Evertaut, Ltd., London, and the tubular racking is by George H. Gascoigne Co., Ltd., Reading. Conveyors were installed by J. Collis & Sons, Ltd., London (roller), and A. L. Marshall (Carlton), Ltd. (band), and the chute by Sovex, Ltd.

Electric pallet and stillage trucks are products of Lansing Bagnall, Ltd., Basingstoke (pedestrian-operated), Salisbury Precision Engineering, Ltd. ('Sherpa' stacker), and Wingrove & Rogers, Ltd., Kirkby (B.E.V. rider-operated). A 1-ton Conveyancer fork lift truck (Conveyancer Fork Trucks, Ltd., Warrington), licensed for the road, is engaged on the loading and unloading of vehicles at three of the Nottingham warehouses. The 3-ton lifts connecting the despatch department with all warehouse floors were installed by Evans Lifts, Ltd., Leicester



Orders from the branches are dealt with on a strict rota at the rate of 120-180 branches a day. Customers' special requirements are met daily as they are received, and the result is the despatch of up to 2,000 parcels a day.

Though consigned to the branches, or sometimes to customers direct, the goods despatched from Island Street do not necessarily travel directly to the consignees; between 50 and 60 per cent are transmitted via the despatch dock at Beeston, because the wide dispersal of the retail shops demands centralization of as many consignments as possible in the interest of transport economy.

Hence, the bulk of the outgoing stock is loaded on to articulated trailers, which are towed the three miles to Beeston.

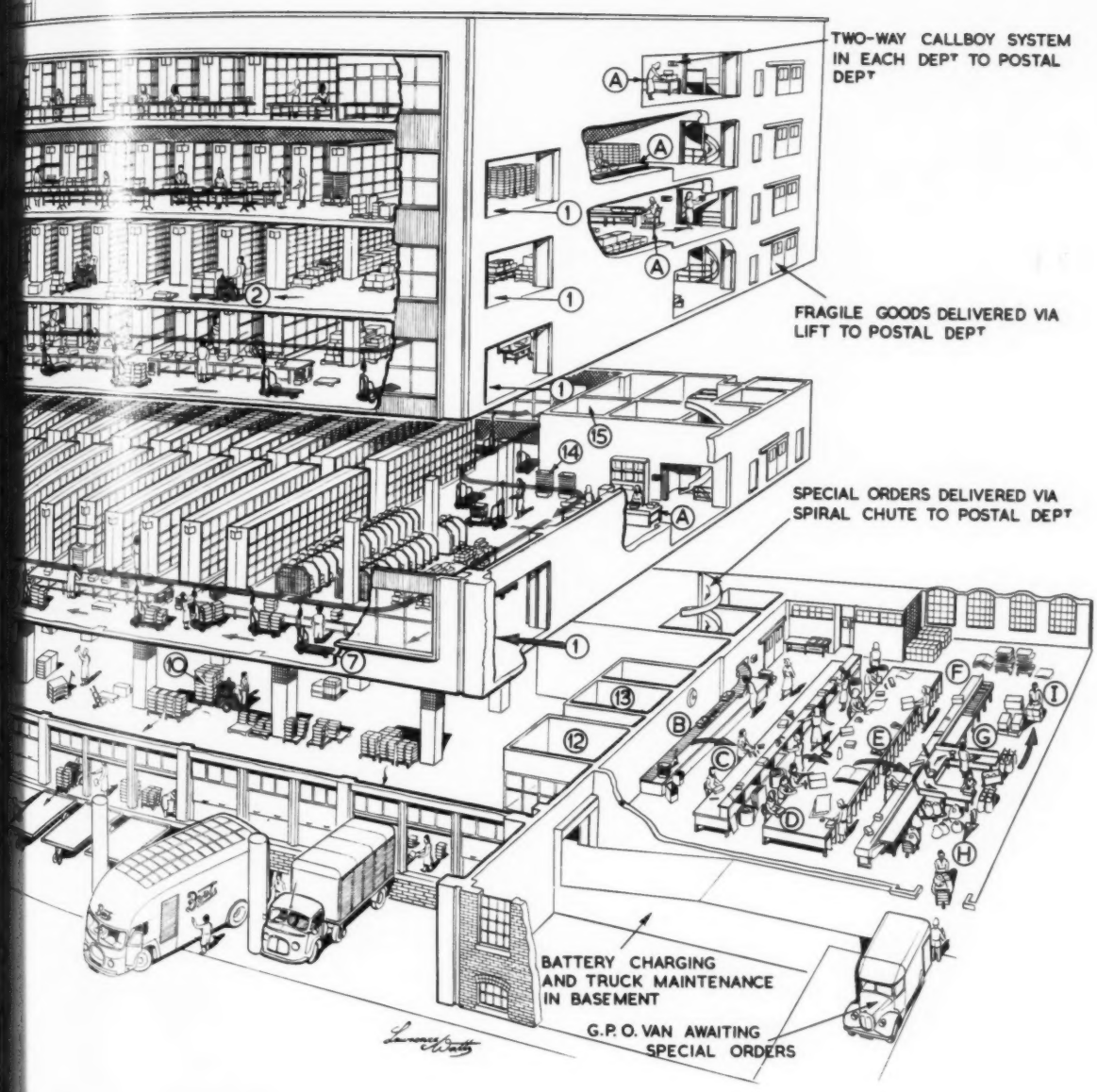
There the consignments are re-assembled with products for the same destinations that have come in from 14 other Boots warehouses and depots in the Nottingham area to form economic transport loads.

To illustrate the current position, the seven days ending on August 23rd, 1958, may be taken as representative, for August is a month during which the fluctuating curve of seasonal trading figures assumes a near-average level. During that week more than 91,000 units, corresponding to an aggregate weight of about 1,700 tons, were despatched from Beeston—74,940 units going by road and the remainder by rail.

When related to others taken over the years, these figures form part of an upward trend; the corresponding returns for next August will be considerably higher. The road/rail ratio will probably have risen also, for up to the time of the 1956 railway strike half the output was sent by rail and the swing to road transport has not been followed by a return to previous methods.

The traffic is shared between Boots's own fleet and outside

Fig. 8. In the toilet goods department, filled containers are passed to packers, who secure the lids and assemble the completed orders on stillages resting on the platforms of the trolleys seen on the right


TWO-WAY CALLBOY SYSTEM IN EACH DEPT TO POSTAL DEPT
FRAGILE GOODS DELIVERED VIA LIFT TO POSTAL DEPT
SPECIAL ORDERS DELIVERED VIA SPIRAL CHUTE TO POSTAL DEPT
BATTERY CHARGING AND TRUCK MAINTENANCE IN BASEMENT
G.P.O. VAN AWAITING SPECIAL ORDERS

contractors, who do most of the two- and three-day journeys. Some 40 lorries are loaded every night and leave Beeston the following morning, but it is felt that two despatches a day will be needed to cope with the rising turnover in the branches, and also that the tendency of increasing numbers of municipal authorities to impose restrictions against parking in the streets may make it necessary to move goods overnight.

Layout

It has already been mentioned that each of the five floors of the new warehouse had to be aligned with those of the existing building. Fig. 7 shows how this has been done and indicates the type of product stored at each level. The layout was based on the following predetermined factors:

(1) Multi-storey construction was necessitated by the tie-up with the existing building.

(2) Space was precious.

(3) Multiplicity of lines and of individual branches meant that order-picking and packing would be the major warehousing functions.

(4) The operation of a strict rota system meant that orders must be assembled and transported quickly and promptly.

(5) A proportion of outgoing goods must be off-loaded at Beeston before final dispatch.

For these reasons it was decided that the goods must be assembled in unit loads before they left the floor on which they were stored, and that the entire warehousing system must be based on the unit load. Lifts were chosen as the quickest means of carrying the material from floor to floor with the least possible demand on space.

At the east end of the warehouse, in a position convenient to the loading and unloading bays, a battery of four 3-ton lifts has been installed. They travel from top to bottom of the building at a speed of 150 ft/min under the overriding control of the despatch manager on the ground floor. When

10

11

Fig. 11. *Trolley detached from the overhead conveyor in the area adjoining the lifts. The geographical region in which the goods will be grouped for despatch is indicated by the number on the board*

9

Fig. 9. *This trolley, which can be pushed by hand or propelled by an overhead conveyor, has a platform that can be raised and lowered hydraulically*

Fig. 10. *Trolleys are propelled round the overhead conveyor circuit until they reach the area in which the stillages are assembled before being sent down by lift to the despatch department*

the layout was planned and the specifications were drawn up, the lifts were considered in relation to the unit-load, to which all equipment was subordinated and which was itself related to the goods in store and the characteristics of the orders received from the branches.

The Unit Load

Experience indicates that many handling engineers, if faced with a similar problem, would have contained the unit load in some form of box or post pallet or bin, and thereby sacrificed flexibility or space—or both, and almost certainly have incurred higher handling costs than Boots have done. Many planners would have centralized the packing on the ground floor, and most would have delayed the assembly of orders according to destination until the final operation before loading.

Boots have done none of these things. They pack their orders on the floor on which the goods are stored and assemble them in geographically allied groups, which are formed into unit loads on the packing floor. Consignments are thus in order of loading when they reach the despatch area. The usual work of assembly at this late stage is eliminated, and with it a source of confusion and error. An enormous amount of double handling is avoided by this system, and the more one thinks about it the more one appreciates the ingenuity by which its simplicity has been achieved.

The unit load is, quite simply, an assembly of goods on a stillage having a platform area of 2 ft 6 in × 3 ft 6 in, which is transported on a low-lift truck. The truck, an operator and six stillages can be accommodated in a lift. Eight stillages can be carried on a road transport trailer.

Between 15,000 and 20,000 of these stillages are in use at the Island Street warehouse. Others are supplied to manufacturers and other departments inside the Boots organization and to outside suppliers. Like other enlightened companies seeking to spread the gospel of unit loading, Boots have found few manufacturing firms eager to avail themselves of the opportunity of palletizing at the customer's expense. Of the few exceptions, Kodak and Ilford, two of their larger suppliers, have given them 100 per cent co-operation.

All goods that are not already on stillages when they are received at the warehouse are palletized on arrival. Outgoing goods are kept on the stillages until the last possible moment. Furthermore, many of the fast-moving lines are stored on stillages and remain on them until they are picked out and transferred to the packers. Examples of this procedure can be seen in Fig. 2.

Bulk stock of the types shown in Figs. 1 to 4 is the easiest material to deal with, and is stored on the three upper floors of the warehouse in packages that need not be broken down. It is transported to the storage area by rider-operated battery-electric low-lift trucks of the type seen in Fig. 1 and stacked by fork lift stacker-trucks on tubular racking or on the floor. While orders are being assembled the goods are transferred to stillages carried on hand-operated low-lift trucks of the type shown in Figs. 3 and 4.

12

13

Fig. 12. Stillages loaded with goods for despatch are taken on to the floor of the lift by pedestrian-controlled electric pallet trucks

Fig. 13. An operator demonstrates the scissor action of the lift doors. Four 3-ton lifts travel from top to bottom of the warehouse at a speed of 150 ft/min and each will accommodate a pallet truck, an operator, and six stillage-loads

Fig. 14. Empty containers occupy little space; there are 52 on each of these stillages and a pile of lids can be seen on the trolley on the right

Fig. 15. Loading up trailers for despatch. Each trailer will accommodate eight loaded stillages. The empty stillages carried by one of the rider-operated trucks in use on this floor are being returned for reloading

Fig. 16. Loaded stillages are trucked right on to the floor of the trailer

14

16

Crux of the Warehousing Problem

It is in dealing with the miscellaneous stock stored on the first and second floors that Boots display their special acumen. If one reviews the hundred-and-one items that one has bought over the counter at a retail branch it is easy to imagine how complex the average order on the warehouse must be. In size, substance, and shape, the variety is immense. Though some of the goods can be stored on stillages and handled in unbroken packages, many more have to be put away in bins.

15

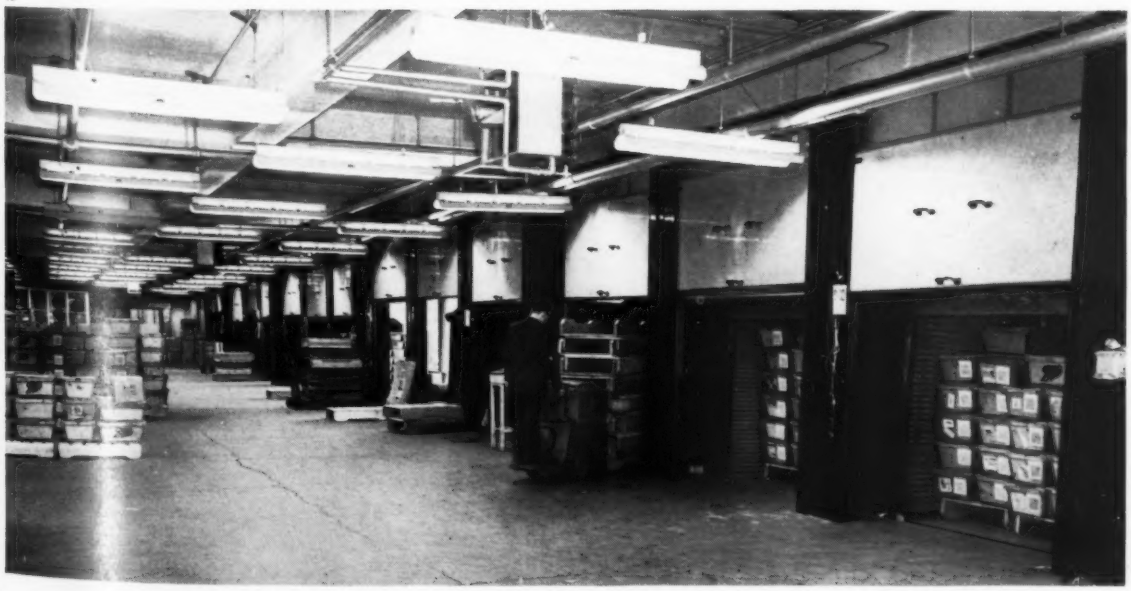


Fig. 17. Section of storage area reserved for special orders

In arriving at their solution of the storage and handling problem, Boots have taken advantage of the one common factor. All these goods are reasonably light in weight and there is no item among them that cannot be picked up by hand. By breaking down the final unit load into standard sub-units of handleable size, in which an order or part-order can be assembled, and bringing the sub-assemblies together at the packing stage, they have made optimum use of the stillage while maintaining the maximum possible degree of flexibility.

On these two floors, the unit-load system is achieved by means of three basic items of equipment: nesting containers, hand trolleys, and trolleys towed by overhead conveyors.

Orders are packed into containers carried on the tubular-steel trolleys seen in Fig. 5 and 6, which are pushed by hand among the storage bins and stillages. When a container is filled it is designated by a coloured label bearing the number of the branch to which it is going and passed to one of the packers. With the complete order to guide him, the packer secures and collects together the necessary number of containers and places them on a stillage that stands behind him on the platform of a low-lift trolley. Finally, when the trolley has received a full stillage load of one or more completed orders, he attaches it to the overhead conveyor by which it is propelled round the perimeter of the storage area until it reaches one of the lifts.

A System of Unusual Flexibility

These detachable conveyor-propelled trolleys are unusual, if not unique, in having hydraulically operated lifting platforms. Unlike those used in similar types of equipment, they can pick up and set down their loads, and it is this feature that gives the system its exceptional flexibility.

One of the trucks can be seen without a stillage in Fig. 9. It has been detached from the overhead conveyor by operating a foot-controlled release mechanism that allows the mast to drop below the level of the pusher-bar by which it was propelled. The vertical hand-lever is used for pumping the hydraulic jack by which the platform can be raised through a distance of 4 in.

On each of the two floors one of the overhead conveyors makes a 500 ft circuit enclosing the storage area. With pushers at 10 ft pitch, it can accommodate 50 trolleys, but the capacity can be raised if necessary by reducing the spacing to 9 ft. At £10,000 for each floor, the initial cost of installing the system was substantial. Running costs are low, however, and the incidental savings that have resulted from its use have more than justified the capital expenditure.

In the area adjoining the lifts a man is waiting to receive the laden trolleys and assemble the stillages in groups according to their destination. He detaches the trolley, which carries a board indicating the number by which the geographical region is recognised, pushes it to the appropriate station, lowers the platform to set down the stillage, which is replaced by an empty one, and returns the trolley to the conveyor for recirculation.

Groups of stillages are held until the transport manager on the ground floor is ready to receive them. They are then transferred by low-lift pallet trucks to the floor of a lift, lowered to the despatch department, and transferred by means of similar equipment to the waiting lorry or trailer. Congestion of the loading bays is prevented by this arrangement and time is gained at a stage when it is precious. Loading of the high-speed lifts is hastened by the double-acting doors, which move upward and downward to meet at the centre. And here it should be mentioned that the photograph reproduced in Fig. 13 was taken to show the action of the doors. With two men and an empty truck apparently about to go down, it must not be assumed to represent a true operational procedure.

Nesting Containers

An essential function in the system that has been outlined is performed by the plywood containers in which orders are assembled and packed for delivery to the branches. They were designed by the warehouse staff to dimensions—24 in × 18 in × 10 in deep—found, after analysing the many factors involved, to provide the best compromise. With sloping sides and detachable lids, they take up

very little room when emptied and nested for return. Our picture in Fig. 14 shows 52 nesting containers on each of the stillages, and a pile of lids returning to the packing bench on a conveyor-propelled trolley.

Three years ago the containers were brought into service, at a cost of approximately 13s. each. Between 175,000 and 200,000 are now in use, including most of the original batch, of which less than 5 per cent have been destroyed or damaged. Their estimated life of 60-70 journeys will certainly be greatly exceeded.

Two loaded containers can be carried on a tubular steel trolley. Light in weight and well balanced, it is easy to manipulate. Two containers are insufficient to accommodate an order from one of the larger branches, which would be split by the supervisor and allocated in parts to two or more girls. As already explained, the separate parts would then be brought together by the packer, who has the full delivery note.

In this procedure, as in others, Boots follow an unusual course. And, here again, their method is based on a realistic and accurate analysis of the conditions obtaining. There are 4,000 lines in the first-floor toilet goods inventory, and the time taken to assemble orders may vary over a wide range. Some items, such as hair-nets, may be specified by a complex combination of colours, weights, and textures, whereas others, such as tooth brushes, can be selected at a glance. For this reason alone, an arrangement that allows each girl to work independently, at her own speed, is the sensible one.

Quite apart from special circumstances, it has the effect of speeding up the work. Girls who are quick, work faster than they could if the orders were relayed among a group of which each member operated in a section of the store. With waiting time eliminated, a well-known source of frustration is removed. At peak periods, when additional staff must be engaged, there are none of the complications involved when new members are taken into a group. Under circumstances where the throughput is more than doubled during these periods—rising from a normal level of 300 tons/week to 700 tons or more—such complications could be disastrous. It might be argued that too much walking is involved, but this is a case where psychological advantages far outweigh the adverse findings of a motion study. There is also an important technical advantage to be derived from the versatility acquired by every order-picker.

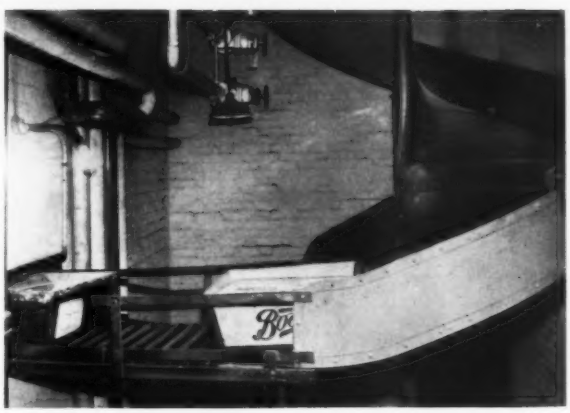
The system works well for the packers, who are kept steadily fed—three pickers serving one packer. Thanks to the conveyor-propelled trolleys, they are also able to get rid of their work as soon as it is finished. It works well all along the line of despatch—from the checking and grouping of consignments to the loading of vehicles.

Special Orders

Fig. 17 shows some of the bins reserved for special order goods—items made up into the 2,000 parcels or so a day mentioned earlier, that may have to be added to the normal rota. Until recently these items were stored with the rest of the stock, but the system was changed when an analysis of orders revealed that certain lines recurred with such regularity that they could with advantage be located in a separate section and assembled by a special order team.

Instead of going through the normal sequence of packing and despatch, they are packed on the ground floor and sent by post to the customers. The packing department deals with special orders from all floors and is connected with them by the spiral chute seen in Figs. 18 and 19, which discharges on to a roller conveyor running against the wall along one end of the department.

Parallel with the roller conveyor are three rows of wide work-tables extending the full length of the room. On the first of these tables the goods are assembled according to destination, each order being held back until a specified



TOP

Fig. 18. A special-order container being transferred to the chute terminating in the ground-floor packing department

Fig. 19. Special orders discharged from chute on to roller conveyor

time to allow complementary orders to be grouped together. Packing and wrapping are undertaken as separate operations. One wrapper, it is found, keeps pace with three packers.

Finished packages are placed on the band conveyors seen in the background of Fig. 21, which run in opposite directions and converge upon a central bench serving the weighing and stamping section.

Some of the Gains

Goods stored in all sections of the warehouse are assembled, packed, and away, eight hours after the order has been received. Though many of the benefits accruing from the procedures and equipment described are difficult, and perhaps impossible, to evaluate with any precision, there can be no doubt that the high level of efficiency reached in the face of difficulties has only been made possible by these well-planned techniques.

Branches share the benefits, sometimes in a specific sense. The nesting containers for example, are easy to handle when they reach the branches; goods that would previously have been despatched in a heavy wooden packing

case can be accommodated in three or four containers, and 12 empty containers occupy the space of a single case. The tubular trolleys are easy to handle in the shops and are greatly appreciated.

Improvements in the efficiency of vehicle loading resulting from the adoption of the unit-load principle can be measured directly in terms of quicker turnround and reduced man-hours. One man operating an electric vehicle now loads a trailer in less than 4 min, and when incoming goods are palletized unloading time is reduced from 3 hours to less than half an hour.

Important above all things, though probably not amenable to direct proof, is the adequacy of the new system to cope with the rising throughput at peak periods. A level of efficiency below that achieved at the Island Street warehouse would afford no margin of capacity for the future and it is only by an arrangement affording space, speed, and flexibility, that anxiety could have been allayed.

Plans for the Future

In a unified organization, where the management has the vision to comprehend the various activities as an integrated whole, it becomes increasingly difficult to determine the boundaries of the handling function.

In the Boots Island Street warehouse the paperwork affects and is affected by the layout of the storage area and the method of handling goods. On the standard order form covering the major lines the sequence in which the items are grouped is the sequence in which they are stored. This standard form, produced in triplicate, serves as a delivery note, invoice, and warehouse record. It is used by the packers to check the completion of the order and thus becomes part of the system whereby orders are split for assembly on hand trolleys and brought together again on the truck-mounted stillages propelled by overhead conveyor. The splitting and re-forming of the order is the idea on which the logic of the entire handling system is built, and the system is extended beyond the warehouse to the manufacturing and selling organization.

Fig. 21. Packing and postal sections of special-order department

Fig. 20. Conveyor passing through wall into special-order packing department

In their plans for the future, Boots are including an electronic data-processing project which will maintain a perpetual inventory of warehouse stock and simplify the assembly of orders. It will also enable the stock level to be geared closely to demand.

Boots have already gone a long way with this plan. They have designed and printed a mark-sensed punched card for use by their retail shops when ordering goods, and are preparing a pilot scheme for testing its practicability. The cards will be used in a vertical position, in conjunction with a pre-printed stockbook, in such a way that the mark sensing columns of a card will appear horizontally in line with the pre-printed items. To order a quantity of an item which appears on, say, line 15 of page 4 of the stockbook, it will be necessary only to mark the page number at the head of a card and mark the quantity required on line 15 of the punched card. It will be possible to mark up to 48 orders on one card, using both the front and the back. The marking code is so designed that almost every order will require only one mark. The cards will be sent to the computer department where the marks will be converted into holes in the cards. The information will then be processed by an Emidec computer using a specially modified card reader and a programme which will automatically determine the code and description of each line by recognising the line on which the marks were made on the order card. The resulting branch invoice will give a full description of each item ordered, and will print the items in bin sequence for ease of assembly in the warehouse.

A continuous record of the theoretical stock of each item in each warehouse will be maintained by the computer. Orders for items out of stock will be transferred to a 'to follow' file, and will be supplied as soon as goods are available. The computer will also indicate by means of a predetermined formula any lines for which the stock has reached a critical level, or for which no stock is available.

A completely integrated electronic data processing system could theoretically be achieved by designing a cash register capable of registering sales in code and thus creating an initial record of stock movement at the point of sale to the customer. Considerable effort has gone into developing this project and complete integration by this or other methods remains a long-term aim.

Acknowledgment

We are grateful to the directors of Boots Pure Drug Co., Ltd., for allowing us to visit their Beeston factory and Island Street warehouse and to members of the staff of these establishments for the facilities and courtesy they have extended to us.

Conveying System for New Central Grocery Package and Delivery Service Depot for the Leeds Industrial Co-operative Society Ltd

HANDLING OF GROCERIES IN BULK PACKAGE AND PARCEL FORM

By O. Winfield*

Fig. 1. Ground-floor belt conveyor circuit running along side of building with rolelr shutter doorways. These conveyors (D & F) are for direct loading into or out of storage

AN INTERESTING SYSTEM of conveyors for the handling of groceries in bulk package and parcel form has just been completed by Mechanical Equipments, Ltd., for a new L.I.C.S. central depot. The scheme is intended to provide a main storage depot for (1) the servicing of the Society's 'travelling shops', and, (2) for the packaging and delivery of customers' weekly grocery orders for the Leeds district, thereby reducing the responsibility for these deliveries by the individual district branches where the orders have been placed.

The general layout of the plant and building is shown in Fig. 2. The new building is well appointed and contains, in addition to the conveying and ancillary equipment, offices, canteens and other staff amenities sections, refrigeration chambers and bacon-preparation room.

At ground-floor level, there are 14 roller shutter doors in the wall along the whole of one side which are for access by all road-service vehicles. Incoming bulk goods for storage in the form of cases, packages and sacks are unloaded from the vans on to the horizontal flat belt conveyor (F, Fig. 2) at any part of its length according to the position of the doorway being used, the goods being conveyed along and around a gravity roller conveyor loop at the end and on to the second flat belt conveyor (D) running parallel to the first conveyor and in the opposite direction. The packages are then taken off anywhere along the length of belt according to the location of the storage for the particular commodity in question. Most of the remaining area of the ground floor is intended for this storage purpose.

* Chief Engineer, Handling Division, Mechanical Equipments, Ltd.

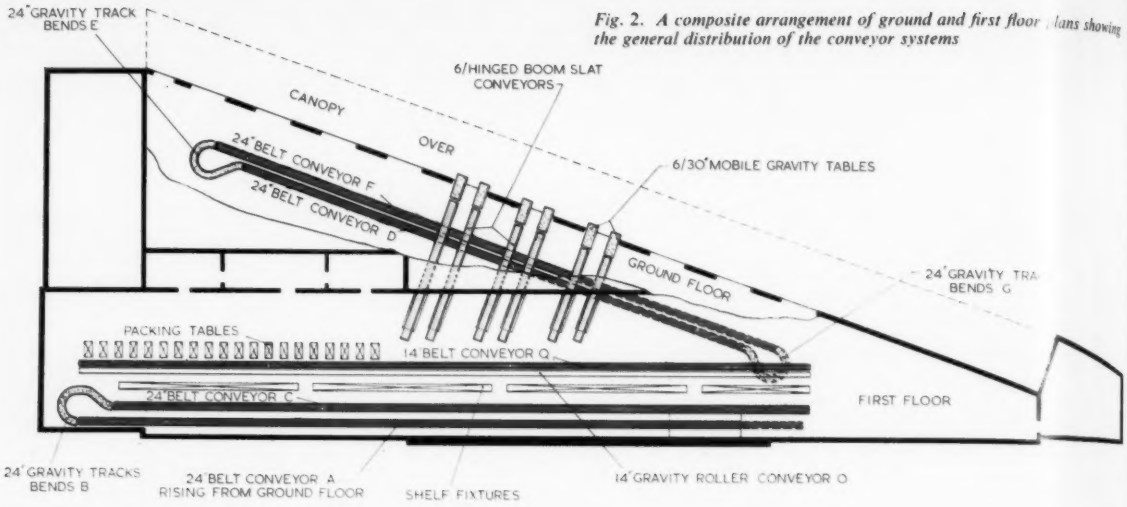


Fig. 2. A composite arrangement of ground and first floor plans showing the general distribution of the conveyor systems

Another function of this conveyor circuit, having gravity roller conveyor loops at both ends, is for the taking out of bulk goods from the storage on this floor and loading them anywhere along the length of the inner run of conveyor. They are then conveyed around the other end loop and back along the line of doorways for stocking the goods on to the 'travelling shop' vehicles standing outside against the doorways.

The two conveyors forming this circuit have rubber covered belts and variable speed drives to give a range of belt speeds from 15 ft/min to about 45 ft/min. It is anticipated that for the most part they will operate at the faster speed of about 30 ft/min to the maximum.

Against the far main wall (see Fig. 3) is another flat belt conveyor (A) inclined up through an opening in the first floor and continuing horizontally along this side to the far end of the building.

Cases and cartons from the general storage are loaded on to this conveyor, the packages first having the top covers removed or opened, and are conveyed to the end where they travel around another gravity roller conveyor loop which doubles back to join another long run of flat belt conveyor (C) alongside the first and running in the opposite direction (see Fig. 4). Here again, the drive speed is variable by handwheel control from about 15 to 45 ft/min and will mostly operate at the lowest speed.

This particular conveyor has the belt running on continuous hardwood table tops instead of idler rollers and a series of bend pulleys at the tail end provide a reasonable depth between the top and return strands for the latter to be used as a conveying medium also; continuous hardwood tables being fitted under this return run.

As the opened cases and cartons proceed along the second conveyor, which extends the whole length of the building, operatives remove the individual goods from the cases and place them in shelf fixtures running down the room parallel to the conveyor. Goods are placed in these shelves in assorted positions according to their particular nature—much in the same manner as they are arranged in actual shops. At the far end of this run the boxes and cartons, being finally empty, are removed and sent down a chute to the lower floor for disposal.

Fig. 3. Feed end of flat conveyor A for taking opened cases and boxes from storage up to second floor and along to far end of building. Note gravity take-up gear

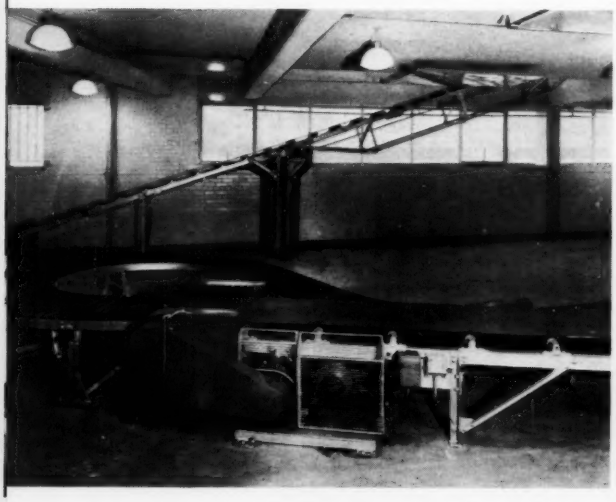


Fig. 4. Arrangement of distributing and packaging conveyors on first floor. The main servicing conveyor (C) with its double conveying belt strand can be seen to the left. The shelf fixtures between the two main lines of conveyors are not shown installed at this stage

ABOVE
Fig. 6. Heads of the six slat conveyors for taking the completed parcels down into the delivery vans stationed at the doorways at ground level

BELOW
Fig. 5. Arrangement of the gravity roller loop end of conveyors 'A' and 'C' and the transfer end of conveyors 'O' and 'Q'. Flat belt conveyor 'Q' runs past the beginning of its line of packaging tables just off the foreground

If for any reason a box should reach this end with some commodity still not removed, the article or articles concerned would be taken out before removing the container and placed on the lower strand of the belt for returning up the line of operatives stocking the fixtures. In the unlikely event of such an article not being picked up a second time, a plough arrangement on the lower strand at the feeding end of the conveyor enables it to be transferred into a basket or similar receptacle placed on the floor at this position.

Up to this stage all handling of goods has been in the form of stock items into or out of storage. The proceeding stages are for the service of packaging and despatch of parcels representing orders for groceries placed by individual customers at the various branches and passed by the latter to this central depot for execution.

Along the opposite side of the shelf fixtures previously referred to, which are open from front to back for the purpose, is a full-length run of horizontal gravity roller conveyor (O). Containers are pushed along this conveyor by another line of operatives standing between the rear side of the shelf fixtures and the conveyor. The various commodities are filled into the containers from the shelves according to the separate requirements of individual customers' orders. In other words these workers are in effect 'going shopping' from the shelves so that finally each filled container represents a customer's order for groceries.

The containers are ultimately pushed along to one end of the gravity roller conveyor where they are transferred onto a moving flat belt conveyor (Q), again having timber tables under the carrying stand (see Fig. 5). This conveyor, operating at a speed of approximately 15 ft/min (but

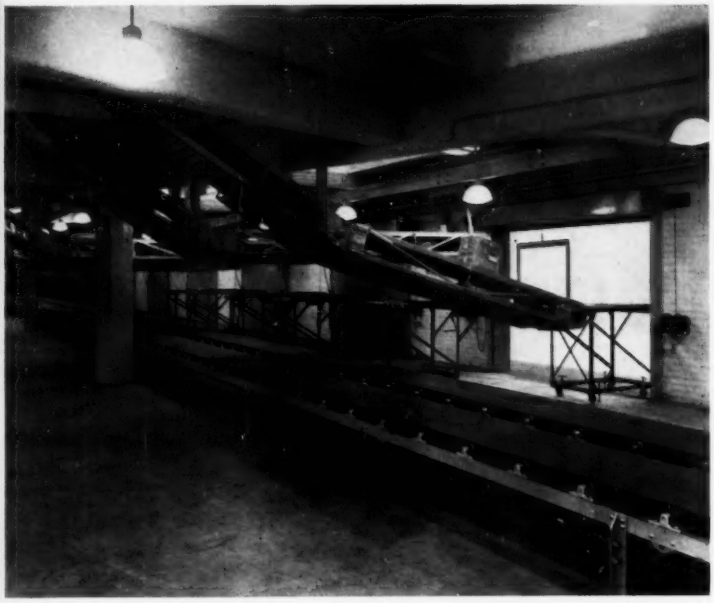


Fig. 7. Slat conveyors from first floor packaging department with nearest conveyor shown lowered by hoisting gear and portable gravity roller table in van-loading position

These slat conveyors convey the parcels through openings in the floor to positions opposite the doorways at ground-floor level (Fig. 7). The forecourt outside the building doorways is at a lower level than the building floor to allow delivery vans to back up to the doorways at a suitable level for the parcels to be loaded direct into the vans. This is achieved by having separate mobile gravity roller tables which, when required, are positioned at the despatch end of each of the slat conveyors to span the distance into the waiting van. The lower part of each of the slat conveyors is hinged at the point of emergence through the upper floor and the forward booms are suspended by wire-rope hoisting gear with worm-geared winches mounted on the wall between the doorways. In this way the booms can be raised to head clearance height above the ground floor when not in operation.

For all the conveyors on the upper floor the belts are of rubber-bonded cotton duck with anti-friction surfaces suitable for running on flat timber tables.

As is essential where so many people are working near and alongside moving machinery, all the conveyors are guarded by both totally enclosed welded plate covers and wire mesh guards, and the installation presents a pleasant, neat appearance. Control of all conveyors is such as to allow stopping and starting by both ends of the lines with additional emergency stopping switches in between.

The conveyor installation as a whole represents generally a rather lighter standard of work than the more usual industrial mechanical handling plant and equipment dealt with by Mechanical Equipments, Ltd.

variable to three times that speed if required), travels past a line of packing tables where the containers are removed for packing of the goods into parcels for despatch. The completed parcels or packages are replaced on the belt at the various points and carried down the room to a position near the heads of a series of six slat conveyors at floor level (see Fig. 6).

SLAG REMOVED WITH TRACTOR SHOVELS

At the Great Lakes Steel Corporation mill at Ecorse, Michigan, U.S.A., which produces an annual output of approximately 3,500,000 tons of ingots, Allis-Chalmers tractor shovels*—three HD.21G's and four HD.11G's—are employed for slag removal. The slag, formed when the metal is separated by melting, generally rises to the surface of the molten metal and flows from the ladles into 'thimbles', but some slag may overflow through runners, designed for this purpose, to the floor of the slag pit.

The accumulated slag on the pit floor must be removed as quickly as possible to permit access to adjoining furnaces. This work is done as soon as the slag has cooled sufficiently for handling.

The manœuvrability and large capacity of the tractor shovels enables them to do this work quickly. The HD.11G's are primarily used for general cleaning-up work, being able to operate in the slag pockets between the furnaces. They are also used to clean out the open-hearth furnaces when rebuilding.

The HD.21G tractor shovels pick up slag fed to them by the smaller tractors, and are also used for cleaning-up the open part of the slag pits, which are constructed in such a manner to allow the molten slag to drain freely into this area.

The HD.21G's deposit the slag into rail trucks which move the material from the premises. It takes only about 12 minutes to load a truck.

* Mackay Industrial Epuipment, Ltd., are sole concessionaires for all Allis-Chalmers construction equipment in the United Kingdom.

Speed Essential

Speed is of utmost importance in this work, because an accumulation of slag on the floor would prevent ready access to a new heat when it was ready for pouring, and this would result in the serious deterioration of a steel output valued at approximately £12,000. Cleaning-up operations are usually undertaken after two or three heats, depending on production schedules.

There are 17 open-hearth furnaces at the Great Lakes Ecorse Mill, 12 in line in the main area, and five in another. Production figures vary widely, but a typical furnace output may be 500 tons in one heat. At full production capacity, a furnace might be ready for pouring and cleaning about once an hour.

A wide bay separates the pouring side of the furnaces from a standard-gauge railway. The automatic trucks for slag removal, and the low-loading trucks which hold the steel moulds, operate on this track. The trucks must be positioned carefully in advance so that slag removal can be co-ordinated with the pouring operation.

Because efficient operation of the tractor shovels is of paramount importance in the slag-removal work, special emphasis has been placed on the proper training of operators. Supervisors also were given instructions on the operation of the tractor shovels. This plan was started in the belief that a full understanding of the use of the tractor shovels in slag removal can greatly increase the effectiveness of the operation of the plant.

NEW 20-TON MOBILE CRANE

The Jones KL range of mobile cranes is extended by the new 12-20 model with two-wheel drive, hydraulically assisted steering and transmission lock, which will be available also with four-wheel drive and in rail-mounted and lorry-mounted versions

Fig. 1. The new 20-ton mobile crane in the Jones KL range undergoing stability tests

As we go to press, the final adjustments are being made to the first production model of the KL12-20 mobile crane. With a lifting capacity of 20 tons on outriggers, or 12 tons free, it is the biggest and youngest member of the large and growing family of Jones cranes. Though equipped with hydraulic steering gear and other refinements, it is still very much a machine in the KL tradition, relying on diesel power and direct mechanical transmission as the simplest, most reliable, and most economical means of operating the hoisting, derricking and slewing motions.

Seen as it was when our photographs were taken, in the Letchworth works of K. & L. Steelfounders & Engineers, Ltd., the machine was identified with the background to which KL cranes owe their characteristic toughness and reliability. The KL 12-20 seen nearing completion in Fig. 3 was designed and developed in an environment that manifestly favours these invisible basic qualities, for the works contains a carbon-steel and alloy-steel foundry rated as the third largest in the country and famous for the quality of its castings. The machine shops have a comprehensive equipment of heavy-duty and light-duty machine tools; plate shops, welding shops, toolrooms, and inspection departments are correspondingly well found.

Quality is checked at every stage of manufacture. The laboratories are provided with facilities for making immediate chemical and physical tests of samples taken from every batch of incoming raw material, and searching static and dynamic test-procedures are used for the examination of work in progress and finished parts and assemblies.

Few Bought-out Parts

Like those that came before it, the new crane was designed, built and tested in a department that can and does perform the full functions of product research and development. The value of its work depends on the ability of the staff to formulate the significant problems inherent in a project and devise means for analysing and resolving them, an excellent example of which occurred during the development of the hydraulic steering gear for the KL 12-20. This project was undertaken entirely inside the department and led to the erection of the test rig shown in Fig. 5 for simulating the action of swinging the steering wheels repeatedly from lock to lock and the severe fluctuations thereby created in the pressure of the hydraulic fluid.

This rig was used to set up endurance tests designed to enable a study to be made of the behaviour of hydraulic seals when subjected continuously to the impingement of alternating high and low pressures, and the effects produced by variations in the surface finish of the piston and cylinder. They resulted in the production of a satisfactory combination of high-pressure and low-pressure seals and the establishment of the precise roughness-number above which the efficacy of the seal could be critically reduced by irregularities of surface texture.

The work involved in the development of the hydraulic steering ram typifies the nature of the experimental research that may precede the introduction of a new device or the decision to make an engineering change—occasions that occur quite frequently at Letchworth because, apart from engines, gearboxes, couplings, and other proprietary items of equipment, very few parts of these cranes are bought out. Steel castings from the Letchworth foundry are used for many parts subjected to stress, and examples of some of the larger castings can be seen in Figs. 6 and 7. The immensely strong box-section underframe in Fig. 8 is a beautiful example of the welded structures produced in the K. & L. plate and welding shops. The work of the machine shops can be seen in Figs. 13 and 15.

In introducing the extra refinements incorporated in the KL1-12-20 the company were seizing the opportunity to do things they had wanted to do for some time but which could not have been economically justified in relation to the smaller models.

Hydraulic assistance for the steering motion is a very great improvement in a crane of this capacity. It relieves the driver of almost all effort beyond that of control, and enables the wheels to be turned while the machine is standing still. By allowing full advantage to be taken of the low minimum turning circle radius of 30 ft, it enables the 20-ton machine to negotiate bends too sharp for a KL 10-6, although the 10-ton crane has a 6-ft advantage when moving sufficiently freely to achieve its 24-ft outer turning radius.

Another useful, though less major, improvement is the provision of high-advantage winding gear by means of which the outriggers can be extended and retracted with little effort in a few seconds. Another is the better grouping of the driver-operated controls. A great deal of thought has been given to the layout of controls and instruments and many different arrangements have been tried out, with the final result illustrated in Fig. 16.

Some Valuable KL Features

Visibility is one of the strong points of KL cranes, and the driver of the 12-20 enjoys a clear view in all directions through the large safety-glass windows and curved roof-light of his cab. His work is made easy also by the pneumatic power-assistance provided by means of conveniently grouped hand-control levers for the hoist and derrick motions and the arrangement of the automotive-type controls for the engine and transmission and power-assisted brakes.

Ease of operation is conducive to safety, and safety is promoted also by the power of the hydraulically operated four-wheel brakes to hold the unladen crane on a 1-in-5 gradient, and the restraint exercised by the engine-controlled lowering features by which the lowering speed is limited

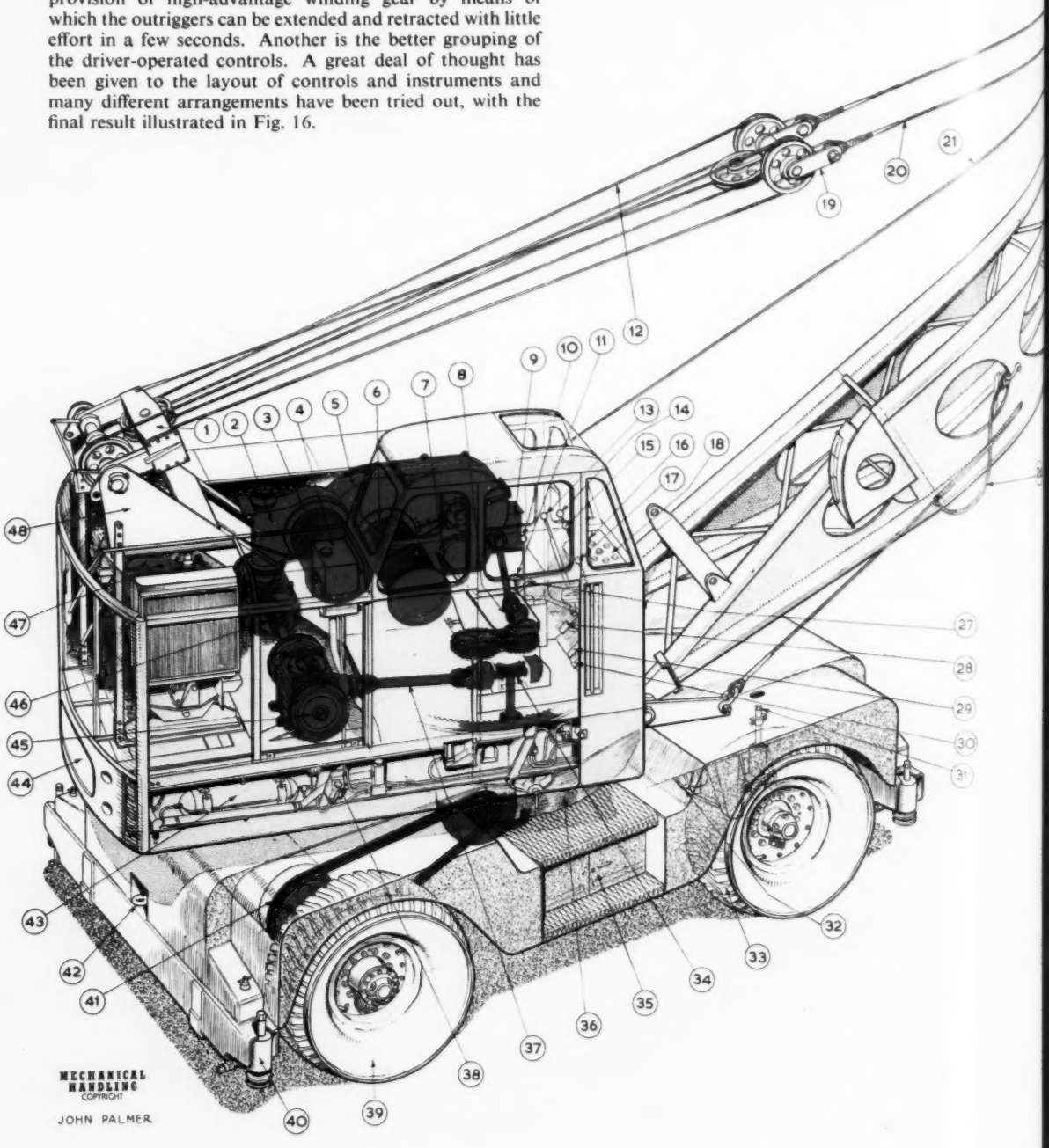
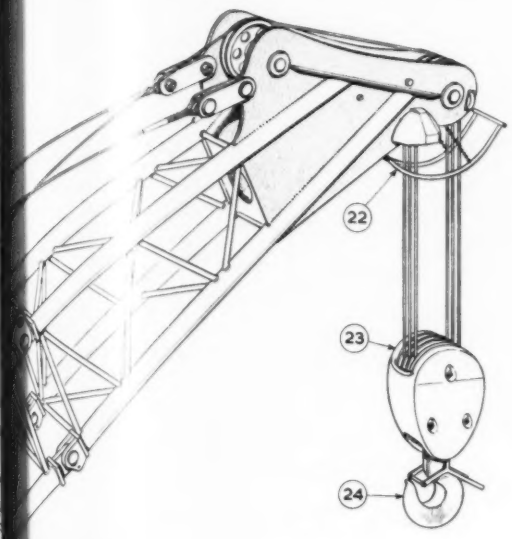


Fig. 2. Our artist's impression of the mobile—KL 12-20M—version of the 20-ton crane with hydraulic steering designed and built at Letchworth by K. & L. Steelfounders & Engineers, Ltd.



KEY

1. Derrick Bridle
2. Derrick Unit
3. Derrick Drum
4. Hydraulic Fluid Tank
5. Hoisting Unit
6. Hoisting Drum
7. Driver's Seat
8. Travel Unit
9. Main Drive Unit
10. Gear Change Lever
11. Engine-controlled Lowering Selector
12. Derrick Rope
13. Hoisting Control Lever
14. Derrick Control Lever
15. Steering Control Lever
16. Slew Control Lever
17. Travel Reversing Clutch Lever
18. Instruments Panel
19. Intermediate Derrick Bridle
20. Derrick Tie Ropes
21. Hoist Rope
22. Jib Head Fork
23. Return Block
24. Safety Swivel Hook
25. 30-ft. Tubular Lattice Jib
26. Wire Rope Buffer
27. Hand Brake Lever
28. Engine Clutch Pedal
29. Travel Brake Pedal
30. Accelerator Pedal
31. Axle Lock Screw
32. Centre Steering Bracket
33. Tyre—14·00 × 24—20-ply
34. Final Slew Unit
35. Tool Locker
36. Chassis Frame
37. Final Slew Drive Shaft
38. Tyre Inflator Valve and Gauge
39. Restrictor Wheel
40. Outrigger Jacks
41. Rear Axle Driving Chain
42. Towing Eye
43. Air Reservoir
44. Tail Balance Weight
45. Slew Clutch Unit
46. Derrick Clutch Unit
47. Power Unit—Perkins 'Four 270D' Engine, Clutch and 4-speed Gearbox
48. 'A' Frame

automatically to a maximum of 45 ft/min and is infinitely and smoothly controllable down to creeping speeds. This facility, in conjunction with a sensitive hoist-brake, enables loads such as steel and concrete structural members or delicate machinery to be placed with precision on bearings or foundations.

Equal outreach fore and aft, and maximum outreach all round, are consequent upon the central mounting of the superstructure, which is located both vertically and horizontally by a slewing ring running on large-diameter ball bearings. Vertical reaction is resisted, and ideal load-distribution secured, by three pairs of rollers mounted in balancer-beams, which operate on the underside of the slewing ring.

Wheelspin on greasy surfaces can be prevented by locking the automotive-type differential, and traction is maintained while travelling over rough ground by the articulation of the front, steering, axle. This can be locked to obtain maximum lateral stability when the crane is travelling on the road or engaged on lifting duties. Another feature assisting stability is the use of restrictor wheels, which increase the bearing area of the tyres, resist deflection, and would support the vehicle against overturning in the event of a blowout or puncture. They also protect the walls from damage and extend the working life of the tyre.

Maintenance is greatly simplified by the patented unit construction of the crane motions, each of which is fully enclosed to form a self-contained unit having jig-drilled bolt holes for attachment to the superstructure to provide interchangeability. Gears are pressure-lubricated from a single tank. As in all Jones cranes, care has been taken to ensure accessibility and ease of maintenance, and Fig. 4 shows that there is plenty of room for access to parts needing adjustment or repair.

Abridged Specification

The mobile crane described in this article and illustrated by our artist's drawing, Fig. 2, is designated the KL 12-20M, the KL 12-20 model being available also in a lorry-mounted version (the KL 12-20L) or mounted on a chassis designed for running on rails (the KL 12-20R). All three versions are included in the abbreviated specification that follows. The crane can also be supplied as a fixed-base machine for mounting on a pontoon or for other stationary applications.

Chassis—The frame of the mobile chassis, seen from the underside in Fig. 8, is an electrically welded unit built up

Fig. 3. KL 12-20 nearing completion in the K. & L. works

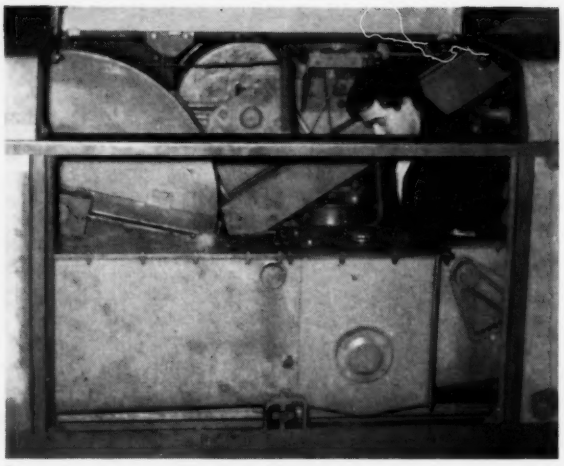


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Fig. 4. Ready accessibility of all parts makes final adjustment easy

Fig. 5. Test rig for determining endurance of hydraulic seals for the steering gear

Fig. 6. KL 12-20 cast-steel stub axle from the Letchworth foundry

Fig. 7. Front axle casing—another K. & L. steel casting

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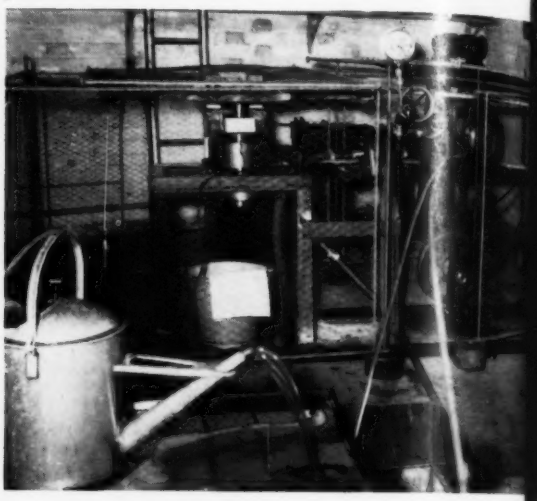

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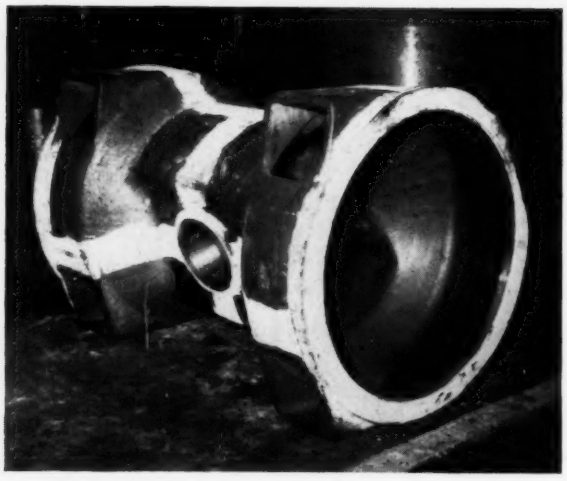

from rolled-steel joists and steel plates to form a box structure of great strength. It is carried on four equal-size 14.00 × 24 in heavy-duty pneumatic tyres fitted between restrictor wheels and mounted on front and rear axles cast from high-tensile steel.

In the rail-mounted version, the standard chassis is designed for a 4 ft 8½-in gauge, but other gauges can be provided for. The railway undercarriage is mounted on eight wheels in two swivelling bogies, all wheels being driven and the bogies being spring-mounted and fitted with spring-locks for use when loads are lifted. Brakes are fitted on all four axles and are actuated from the driver's cab. An overriding brake-control device is fitted on the undercarriage to lock the travelling gear when the crane is not in use. Buffers and drawgear are available for shunting purposes.

The KL 12-20L is mounted on a Foden six-wheel crane-carrier.

Superstructure.—Crane superstructure, with power unit and driver's cab, is carried on a ball-bearing slewing ring providing horizontal and vertical location without the use of a centre-post. Vertical reaction is taken by three pairs of rollers operating on the underside of the slewing ring, each pair being mounted in a balancer-beam and the rollers themselves being carried on eccentric pins that provide means of accurate adjustment.

Power Unit.—Power for all crane and travelling motions on the KL 12-20M and KL 12-20R is provided by the new Perkins 'Four' 270D direct-injection four-cylinder diesel engine, which develops 62·5 b.h.p. at a maximum governed speed of 2,000 r.p.m. and 189 lb/ft maximum torque at 1,000 r.p.m. With four cylinders of 4·25 in bore, and a 4·75 in stroke, it has a cubic capacity of 265·5 cu. in. and a compression ratio of 16:1. It is fitted with 12-V starting equipment.

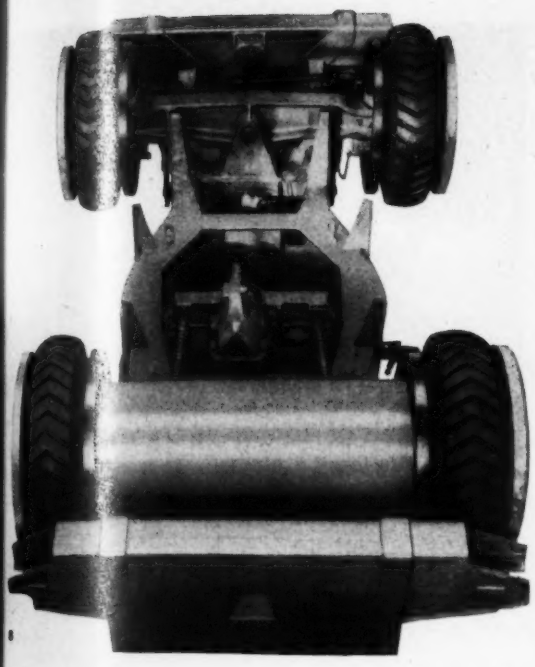

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Fig. 8. View of underside of chassis, showing centre steering bracket, front axle pivot, differential, and chain drive to rear axle

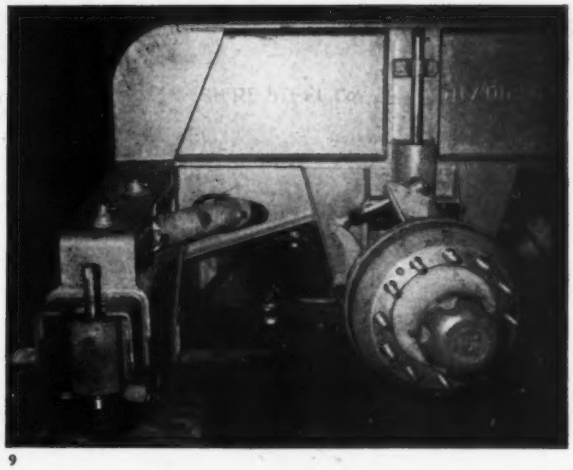

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Fig. 9. Front end and axle assembly, including steering ram and linkage, outrigger jack, and axle lock

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Fig. 10. Detail of steering linkage and brake controls

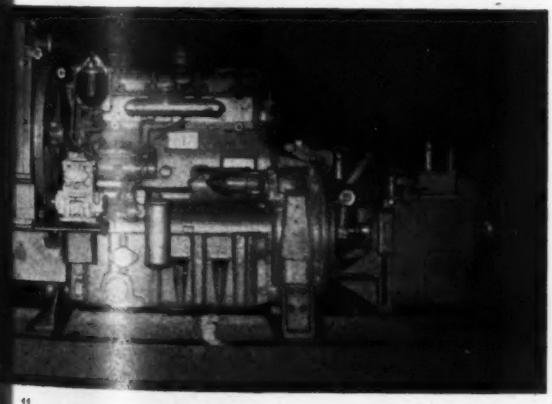

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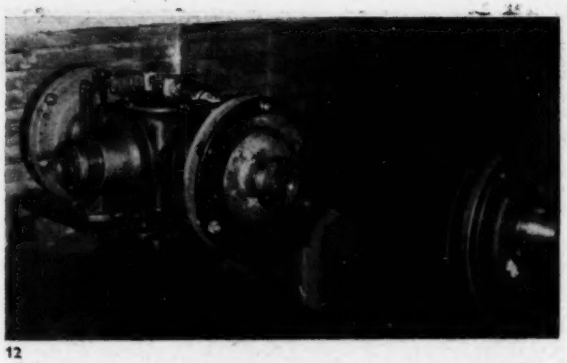
Fig. 11. Power unit incorporating the new Perkins 'Four' 270D direct-injection diesel engine

In the KL 12-20L this engine is used to drive the crane motions only, and the Foden carrier is powered by a Gardner 6LX oil engine of 150 b.h.p., coupled to a five-speed gearbox.

Transmission.—In the self-propelling versions of the KL 12-20 the power from the Perkins engine is transmitted via a 14-in heavy-duty Borg & Beck clutch, with hydraulic control, and a four-speed gearbox of K. & L. manufacture. From the gearbox, the drive is taken by a multi-strand chain-drive running on ball bearings in a totally enclosed oil-bath casing to the various crane motions. A differential of normal automotive type is fitted in the standard mobile version, driving on two wheels, and is provided with a locking device.

In the lorry-mounted version, the power for the crane motions is transmitted in the same way, but the roadwheels of the carrier are driven by the Gardner engine through a five-speed gearbox.

Hoisting and Lowering.—The hoisting unit is located at the front of the superstructure, the grooved rope-drum being driven by machine-cut spur gears through a heavy-duty plate clutch. A gear built into the hoisting unit enables a load to be lowered under control of the engine, the engine being used as a brake. By this means the lowering speed is limited to a safe maximum of 45 ft/min with full load. If desired, this gear can easily be disconnected to give greater lowering speeds for handling lighter loads.



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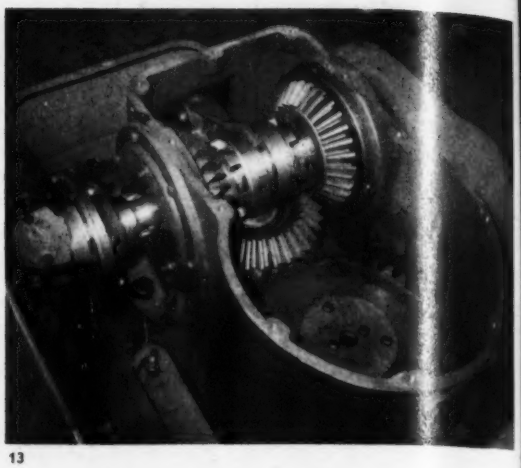

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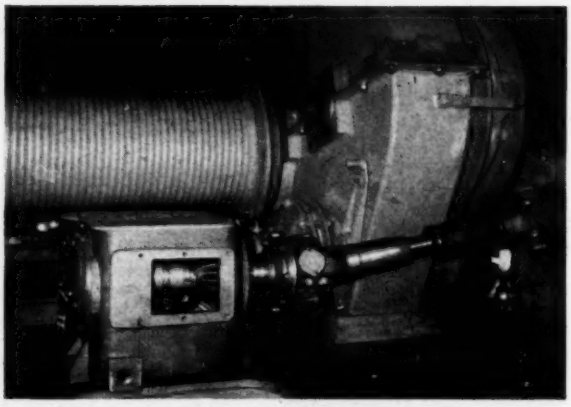

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Fig. 12. *Bevel-gear transmission box*

Fig. 13. *Travel gearbox*

Fig. 14. *Derrick unit, travel box, and connection to main chain case*

Fig. 15. *Derrick unit on test*

15

The hoisting brake is of the two-shoe contracting type. Adjustment, which is required only after long periods of use, is effected by hand.

Slewing.—The slewing motion operates through reversing plate-clutches and its smooth action is aided by the ball bearing slewing ring on which the superstructure is mounted. Hydraulic controls provide sensitive means of obtaining infinitely variable rotational speeds up to a maximum of 2½ r.p.m., and an automatic brake is fitted. Additionally, a positive lock is provided to prevent accidental slewing when the crane is in transit.

Derricking.—Derricking of the jib is obtained through six falls of rope, the grooved rope-drum being driven by totally enclosed worm gearing. A powerful automatic brake is fitted. Upward and downward derricking movements are effected under the control of reversing plate-clutches operated by air pressure, very little effort being required by the operator. Slewing, hoisting, and derricking clutches are identical, thus facilitating servicing when the need for this arises. All the gears for hoisting, slewing and derricking are totally enclosed in dust-tight oil-bath gearcases with centralized pump-lubrication.

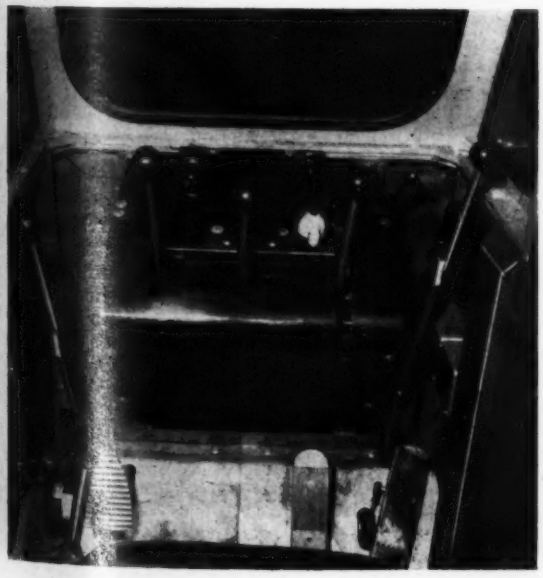
Engine Housing and Bodywork.—The engine and machinery are enclosed in a weatherproof sheet-steel ventilated housing, with access doors to facilitate running adjustments and inspection. The driver's cabin, which is separated from the machinery housing, is weatherproof. The windows are glazed with safety glass and two are openable, the front window being hinged and a sliding window being fitted in the door. Heating or ventilating equipment can be provided for use in cold or hot climates.

TABLE 1. SAFE WORKING LOADS FOR KL 12-20

On outriggers		Free on wheels						
Safe working load,* tons	Falls of rope	Safe working load,* tons	Falls of rope	Radius	Height of lift	Overall height	Outreach	
				ft in	ft in	ft in	ft in	ft in
(1) *With 30-ft jib and 300-ft hoist rope*								
20	6	12	4	10 0	27 0	36 6	5 0	1 0
15	6	10	4	12 0	27 6	36 0	7 0	3 0
11·	4	7·5	4	15 0	27 3	35 0	10 0	6 0
7·5	4	5	2	20 0	25 3	32 0	15 0	11 0
5·25	2	3·5	1	25 0	22 0	28 0	20 0	16 0
4	2	2·5	1	30 0	15 9	21 9	25 0	21 0
(2) *With 60-ft jib and 300-ft hoist-rope*								
9·5	4	6·75	2	15 0	46 9	56 0	10 0	6 0
6·75	2	4·5	2	20 0	46 9	54 6	15 0	11 0
5	2	3·25	1	25 0	45 3	52 0	20 0	16 0
3·25	1	2	1	32 0	44 0	48 6	27 0	23 0
2·25	1	1·25	1	40 0	37 0	41 9	35 0	31 0
(3) *With 70-ft jib and 300-ft hoist-rope*								
6·25	2	4	2	20 0	66 3	75 3	15 0	11 0
3·25	1	2	1	30 0	67 6	72 3	25 0	21 0
2	1	1	1	40 0	62 3	67 0	35 0	31 0
1·25	1	0·75	1	50 0	55 0	59 9	45 0	41 0
(4) *With 90-ft jib and 300-ft hoist-rope*								
3·5	1	Not recommended for use with chassis free on wheels		22 0	91 0	95 9	17 0	13 0
2	1			34 0	87 9	92 6	29 0	25 0
1·5	1			40 0	85 0	89 9	35 0	31 0
0·75	1			50 0	79 9	84 6	45 0	41 0
0·5	1			60 0	72 6	77 6	55 0	51 0

* Calculated at not more than 66·2/3 per cent of the tipping load (British Standard Specification 1757 : 51)

Fig. 16. Conveniently grouped driver-operated controls



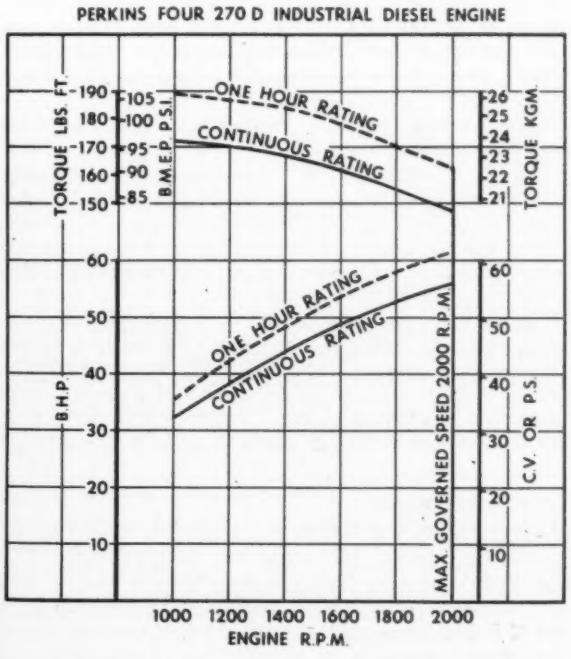


Fig. 17. Performance rating of Perkins power unit for the KL 12-20

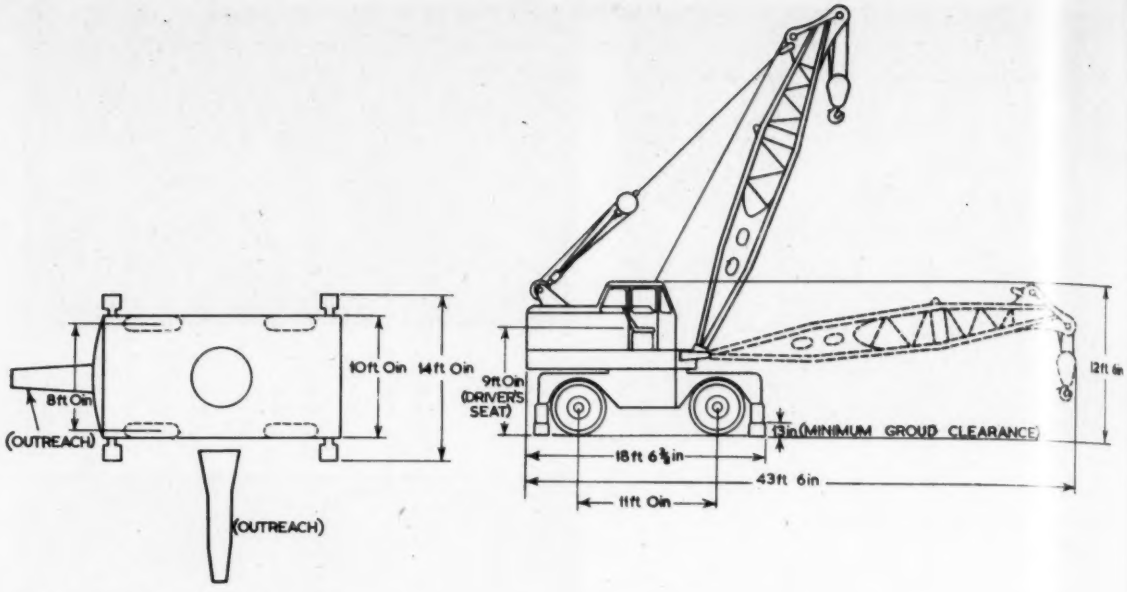


Fig. 18. Principal dimensions of KL 12-20M

The hand controls in regular use are mounted on a control desk in front of the driver. In the middle of this desk is an instrument panel housing the engine-starting controls, electric lighting and trafficator switches, and also the warning lights for a safe-load indicator. There are three foot pedals, as in standard vehicle practice, for engine-clutch, travelling brake, and engine-accelerator.

Jib.—The standard jib is of tubular steel welded to form a straight lattice construction, 30 ft long. It is built in two sections and, by the insertion of 2-ft intermediate sections, can be extended to provide lengths of 50 ft, 70 ft or 90 ft. Other lengths of jib and special types, such as swan-neck jibs and fly jibs, are offered to meet special requirements. Fig. 1 shows the mobile crane in standard form fitted with the 30-ft jib.

Safe working loads for various radii and heights are shown in Table 1.

Safe-load Indicator.—A pendulum-type load/radius indicator is fitted to all cranes, showing the maximum safe loads at all working radii, both when outriggers are used and when the chassis is free-on-wheels. An audible and visual safe-load indicator to comply with statutory building regulations can be fitted if required.

Optional Equipments.—The KL 12-20 crane can be supplied fitted out for grabbing purposes with either single or double drums (for single or two-line grabs). For operating an electro-magnet, a self-contained generating set with control gear can be fitted. The crane in our artist's drawing is equipped with a hoist limit device, which is fitted as standard.

Performance Rating

Crane motions, as given below, are the same for all versions.

Hoisting Speeds.—On single fall, 120 ft/min; two falls, 60 ft/min; four falls, 30 ft/min; six falls, 20 ft/min.

Lowering Speeds.—Engine-controlled from a safe maximum of 45 ft/min (on six falls of rope) down to creeping speeds, but control gear can be disconnected to provide greater lowering speeds when handling light loads.

Derricking Speeds.—From maximum to minimum radius in approximately 50 sec.

Slewing Speed.—Infinitely variable in either direction, up to a maximum rate of 2½ r.p.m.

Travelling Speed.—KL 12-20M attains a maximum travelling speed, unladen, of 8 m.p.h., on level ground; maximum recommended speed with load is 2 m.p.h. KL12-20L will travel at speeds of up to 20 m.p.h. unladen.

Maximum Gradient.—Unladen, on a good hard surface, mobile and lorry-mounted cranes will climb a gradient of 1 in 5.

Turning Radius.—KL 12-20M will turn in a radius between kerbs, on either lock, of 30 ft. KL 12-20L has a turning radius, on either lock, of 40 ft. KL 12-20R can negotiate a minimum curve of 80 ft radius.

Weight.—KL 12-20M, 25 tons; KL 12-20L, crane and carrier, 31¾ tons; KL 12-20R, 52 tons.

Note on the 270D Engine

The 'Four' 270D is the first direct-injection engine to be put into production by Perkins, who claim that it combines exceptionally low fuel consumption with easy starting in cold weather.

The combustion chambers are formed in the piston crowns and fuel is injected directly into the chambers—toroidal bowls slightly offset from the centreline of the pistons—through four-hole injectors offset in the cylinder head. Individual sprays are arranged to ensure maximum air-utilization, and air-swirl in the cylinders is controlled by the inlet passages in the cylinder head without valve or port masking. The passage has been shaped to control the speed and direction of air entering the cylinder throughout the speed range.

With a 4·25-in bore and 4·75-in stroke, maximum torque is developed at 1,000 v.p.m. The engine is fitted with a mechanically governed, distributor-type fuel pump; a large capacity lift pump, push-rod operated from an eccentric on the fuel pump drive-hub; cast-iron wet liners; and a low-level camshaft positioned to provide facility for the easy fitting of power-take-off drives.

G. P. Copping, B.Sc., A.M.I.E.E.,* P. S. Gerard, B.Sc., A.M.I.E.E.,* and J. D. Andrews, A.M.I.E.E.*

THE AUTOMATIC FACING OF LETTER MAIL—PART 2

An article published in the November, 1958, issue of 'Mechanical Handling' described the various steps in the mechanical preparation of mail for automatic facing and cancelling. The present article deals with the problems involved in the completion of the processing

Section 2. Detection of the Stamp

Photoelectric Detection

The photoelectric scanning units are extremely simple devices. They merely comprise a light source, an optical system for projecting a sharply focused light beam, a slotted plate across which the scanned letters are conveyed and a photomultiplier cell. Due to the extreme sensitivity of the modern multistage multiplier cell there is no longer any need to provide some form of light-chopping mechanism in order to generate alternating signals more suitable for amplification.

The unit is illustrated in Figs. 12 and 13. Fig. 13 shows the slotted plate, the conveyor belt (broken for clarity) and a passing letter. The stamp appearing in the illustration will not, of course, be detected by the scanner shown but it will be by the following unit, which scans on the opposite side of the belt run. Fig. 12 shows the optical system and the photocell housing clamped in a light-tight fashion on to the slotted slide plate. The bend in the optical system is included purely for space considerations. Two points of interest are just discernible in the figure. The first is that the appropriate side of the twin-belt conveyor system is led away and around each scanner to permit one side of the passing items to contact the plate and therefore be visible to the interior of the photocell housing through the plate slot. The second is that a cathode follower stage is also built into the housing to prevent signal strength losses which would otherwise arise due to the high impedance output of the cell and the shunting effect of the capacitance of the signalling wires. These wires link the unit with the main electronic control system mounted on the rear of the machine.

The optical system projects a brilliant line of light, measuring approximately $\frac{1}{64}$ in wide by $\frac{1}{4}$ in long, centrally on to the slot opening. The line is formed by focusing the image of a suitably dimensioned light stop that is included in the optical system. The light source is an underrun 36-watt 27-V projector lamp fed from a stabilized supply. The lamp is underrun to give long life and as a further measure to hold the brightness steady. In addition to feeding from a stabilized supply it has been found essential to solder all connections to the lamp as pressure contacts appear to vary their conductivity. The power supplies to the multiplier cell are of course also stabilized.

The multiplier cell housing is designed to bring the cell as close as possible to the plate slot without breaking into the beam which passes very close to it and from which it is shielded. With this arrangement the cell is irradiated with the maximum quantity of scattered light reflected by whatever surface covers the plate slot on the outside of the housing; no extraneous light can reach the cell.

A stamp is assumed to have been 'seen' whenever the level of the reflected light falling on to the multiplier cell drops below a certain minimum. Detection of such an occurrence is achieved by a voltage level discriminating circuit coupled to the cell output and adjusted to ignore signals generated by the darkest type of envelopes in general use and of course by lighter shades up to white. It will be appreciated that a reduction of light falling on the cell results in a lower anode current and therefore a higher anode voltage.

The spectral response curves of the six lowest denomination stamps issued since 1936 have a common low level of reflectivity in the yellow-green waveband (5,500 Angstrom units), and this low reflectivity is considerably lower than that of the vast majority of envelopes. The low reflectivity of the stamps in the yellow-green range is to be expected in the case of the reddish stamps (red, orange and brown) and the bluish stamps (blue and mauve) but hardly in the case of the green stamp which might have been expected to show a high degree of reflectivity in this band. Instead, however, the reflectivity of the green stamp is low over the whole band of visible light and this is now known to be due to the difficulty of manufacturing a pure green printing ink. This enables the signals from the six stamps to be reduced to a common level by using only yellow-green light for the scanning beam. Such an arrangement is readily provided by inserting a narrow-band yellow-green spectrum filter in the optical system. But for this common low level of reflectivity in the yellow-green band a di- or tri-chromatic system would have been required with considerably more associated electronic circuitry.

The overall sensitivity of the system, the stability of which is all-important, remains very constant in consequence of the stabilizing measures taken and although easy means of recalibration are provided, weekly attention suffices. Sensitivity check is effected by inserting an Ilford yellow-green spectrum filter No. 605 into the beam, covering the slot with a piece of ivorine and adjusting the anode current of the cell to a predetermined value.

Obviously a system of this simplicity is open to failure; it is in order to minimize the possibility of failure that the dimensions of the scanning line are quoted so accurately. The line (which is set vertically) permits the cell to 'see' at least one area of dense colour undiluted by lighter areas whenever a stamp moves across the slot, and yet the surface covered by the line is too large to cause the cell to 'see' typing or writing due to the light reflected from the surrounding unmarked paper. Advertisement slogans and sorting

* Post Office Engineering Department, Dollis Hill Research Station.

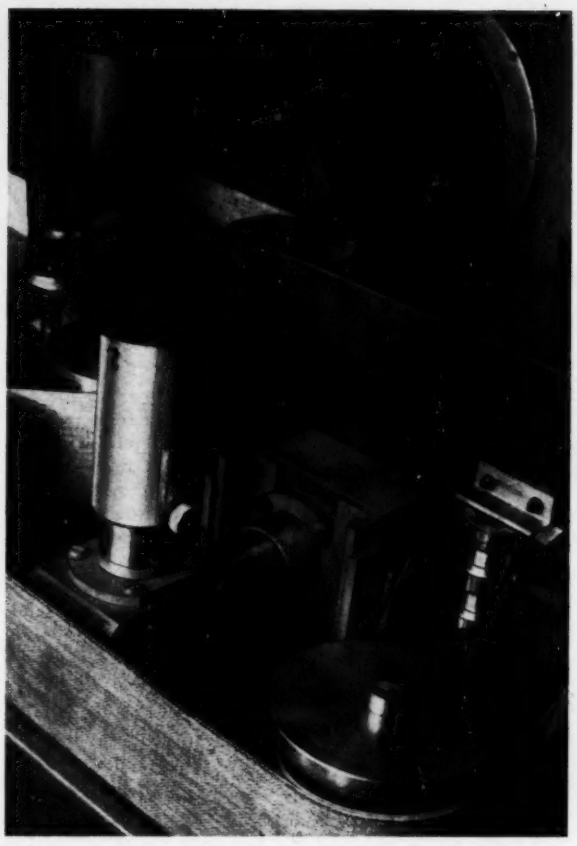
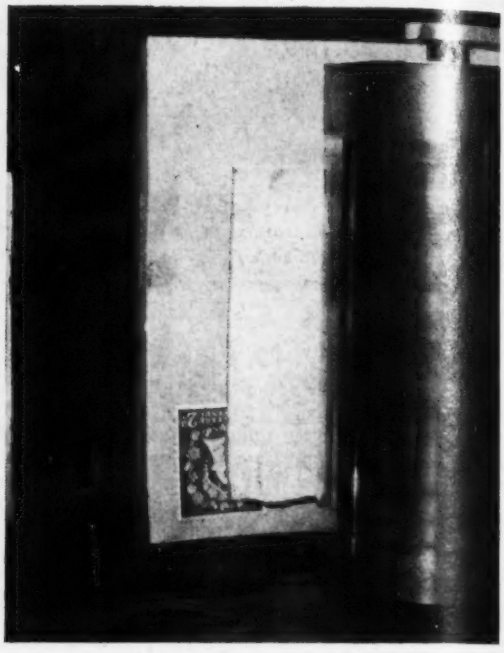


Fig. 12. (*Left*) *Optical scanning unit*

Fig. 13. (*Below*) *Scanning window on photoelectric scanner*



symbols, of the type for instance which appear on football pool mail, do however mislead the scanner. Marks on the belt, which is of course viewed by the scanner between letters, can also generate false signals. In order to remove this fault and also to minimize the effect of marks on items, the area examined for a stamp as the item moves across the slot is restricted by means which will be described later.

The scanning line is positioned very accurately; the upper end is registered $\frac{7}{8}$ in above the line of travel of the lower edges of the passing items so that, due to this setting and the relative sizes of the beam and the stamps, the scanners are enabled to 'see' any stamps which are affixed to their envelopes not more than $\frac{5}{8}$ in down from the upper edge of the envelope as viewed normally. This setting allows detection of stamps on 95 per cent of the *stamped* items. This is quite acceptable as the photoelectric system of detection is now intended to operate in conjunction with another system and to deal primarily to the best of its ability with those items such as official paid, air mail and business reply items, which carry no adhesive stamp. The figure unfortunately does not represent the overall efficiency of the machine. This is barely 90 per cent at present, due partly to the presence of the above-mentioned unstamped letters which the scanners cannot handle infallibly, and partly to embarrassing items which carry heavy marking in one or more 'stamp corners' besides the true stamp—for example, picture postcards. If such items generate two 'stamp' signals they are directed to the reject stacker. This routing is to be preferred to the directing of incorrectly faced items to the faced stacks, but it does reduce the overall efficiency.

It is because of the problem presented by such items and of the need already mentioned for discriminating between the 2d. and 3d. stamp that a second system of detection has been introduced which involves special treatment of the stamps. This latter factor, the discrimination between the 2d. and 3d. stamp, can be catered for by operating two or more optical scanners of the type described simultaneously in well-spaced wavebands, but the electronic signal analysing equipment required to interpret the twin signals renders the system unattractive and it does not remove the degrading effect of the embarrassing items.

Conductive Line Detection

Several methods of donating a special characteristic to a postage stamp in order to facilitate its detection and to enable 2d. and 3d. stamps to be individually recognized have been examined but most of them have introduced serious obstacles. One found worthy of further consideration, however, was to render the stamp conductive at certain points.

Expense ruled out the possibility of burying conductive filaments in stamp paper during manufacture, as is carried out for security reasons with £1 notes. Printing conductive lines on the stamps was the alternative solution, but only a graphite-based ink appeared to offer the desired characteristic. The ink used in the commercial production of the graphite-lined stamps was developed by Harrison & Sons, Ltd., stamp suppliers to Her Majesty's Postmaster General, in conjunction with Achesons Colloids, Ltd. Face and rear views of the six treated denominations of stamps appear in Fig. 16.

Stamps in the ½d.-3d. range printed in this manner have been in general use during the past year in the Southampton area where the automatic facing machine has been under trial. The full treatment includes the printing of a single vertical graphite line on 2d. stamps and the printing of two such lines on each of the other five lower denominations.

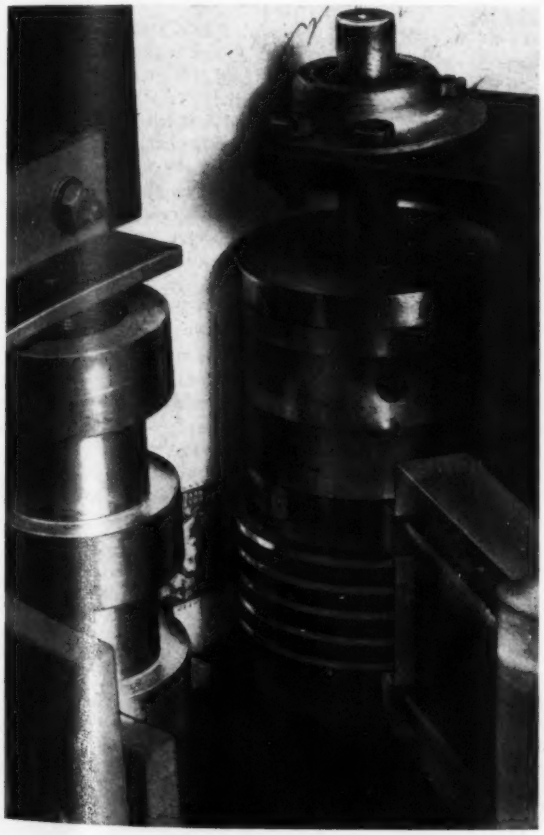
This allows 2d. and 3d. stamps to be distinguished by counting the number of lines detected on each item. By this method a second class item bearing, for example, two 1d. stamps will mislead the machine, but this is of little consequence as the percentage of such items is extremely small and the error is quickly rectified by the letter sorting staff.

Printing the conductive line on the rear of each stamp has called for the development of a special technique for sensing the lines. Detection is achieved by passing the item across two closely spaced electrodes, between which a potential of approximately 2,000 volts is maintained. When these electrodes bridge a line, the potential gradient is sufficient to break down the paper of the stamp to form a partly ionized conducting path which runs through the stamp to the line, along the line and back through the stamp to the other electrode. Flow of current therefore indicates the presence of a stamp.

The electrodes take the form of laminated rollers wherein alternate laminations are insulated from each other and held at different potentials. These rollers are positioned in pairs in order to contact the passing letters on both sides exactly as the photoelectric scanners are positioned. One such roller is illustrated in Fig. 14.

Although the detection efficiency of the graphite line system is good, many items appear with printed or embossed stamps which cannot be detected with this system. Both the optical and the conductive systems of detection are therefore arranged to operate concurrently with preference being given to any graphite signals generated. Only when an optical signal appears unaccompanied by a graphite signal from the same 'stamp corner', or from the 'stamp corner' near the same long edge but on the opposite side, is the optical signal accepted.

Fig. 14. Graphite stamp-sensing roller and brush gear



Section 3. The Electronic Control System

Six distinct functions are performed by the electronic control system. These functions are:—

1. Letter position signalling (photocell-light-beam units).
2. Scanning and signal interpretation.
3. Synchronous storage of identified signals (shelf stores).
4. Signal analysis.
5. Synchronous storage of analysed signals between analysing points and diversion points to faced stacks.
6. Control of diverters.

The above functions are described below.

1. *Letter Position Signalling*

There are no less than 34 points in the facing machine where a photocell-light-beam unit is needed. At most of these points they are required to signal the presence of a letter; the exceptions are where they are used to indicate the position of diverters and where one is used as a component of a synchronous pulse generator. The units comprise a phototransistor spaced some 1 in to 2 in from a 4-W light source (no optical system is incorporated). The dark or light condition of the phototransistor is detected by a hard valve two-position trigger circuit. These units will be referred to as *photobeams* in the descriptions which follow.

2. *Scanning and Signal Interpretation*

The stamp detectors have already been described, but the treatment of the signals generated has yet to be explained. It will be appreciated that the scanners are permanently operative and may deliver signals when a material other than a stamp passes the scanning point. This signal imitation may occur frequently with the optical scanners where printing on envelopes, and even dark patches on the belt, appear as stamps, but the imitation seldom occurs with the graphite line detectors nor will it occur with phosphorescent stamp detectors. In order to reduce the effect of this signal imitation, the scanner outputs are gated so that signals are accepted only when they occur in a 'stamp corner'. The 'stamp corner' has been deemed to extend some $2\frac{1}{2}$ in from a short side and down some $1\frac{1}{2}$ in from the long side; it is the area in which the stamp is expected to be found.

The gating is achieved by using two photobeams with each scanner, so placed in relation to the scanner that one should be dark and the other light when the 'stamp corner' moves across the viewing slot or sensing rollers.

Incorporated in each of the two gates performing the above function for the graphite scanners on the upper shelf (the second scanning section of the machine, see Fig. 8 (*D*)) is a circuit for deciding whether there is one or more than one graphite line. This was originally achieved with a form of counter but, as 'wrap round' of the letter on the detecting roller may prolong the signals causing them to overlap and give one continuous output, a form of time division is now used: a signal occurring in the gating time and more than 5 milliseconds after the start of a signal is deemed to be due to a second line and the appropriate shift register store is marked (see Fig. 15). This distinction between one and two lines is not made on the lower shelf as the value of the stamp is of no interest when deciding whether the letter must be twisted or conveyed without twist (see Fig. 8 (*D*) on p. 210 of April issue).

In order that picture postcards are not misfaced by optical scanner signals from the picture side of the card, the outputs from the optical scanners are fed not only to the leading and trailing edge stamp-analysing circuits but also to two picture-postcard detecting circuits which

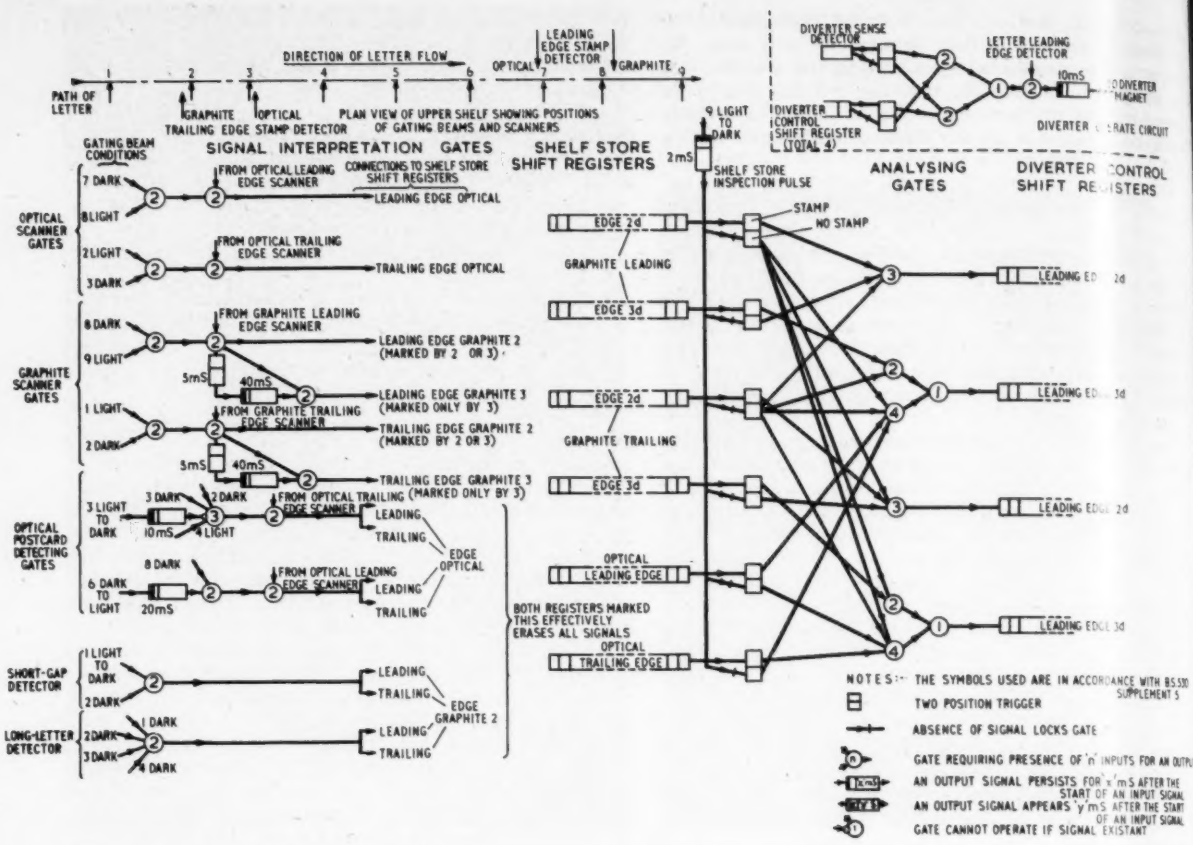

DIRECTION OF LETTER FLOW
LEADING EDGE STAMP DETECTOR
OPTICAL
GRAPHITE
PATH OF LETTER
GRAPHITE TRAILING EDGE STAMP DETECTOR
OPTICAL
PLAN VIEW OF UPPER SHELF SHOWING POSITIONS OF GATING BEAMS AND SCANNERS
SIGNAL INTERPRETATION GATES
SHELF STORE SHIFT REGISTERS
ANALYSING GATES
DIVERTER CONTROL SHIFT REGISTERS
DIVERTER SENSE DETECTOR
LETTER LEADING EDGE DETECTOR
DIVERTER MAGNET
DIVERTER CONTROL SHIFT REGISTER (TOTAL 4)
GATING BEAM CONDITIONS
OPTICAL SCANNER GATES
GRAPHITE SCANNER GATES
OPTICAL POSTCARD DETECTING GATES
SHORT-GAP DETECTOR
LONG-LETTER DETECTOR
FROM OPTICAL LEADING EDGE SCANNER
CONNECTIONS TO SHELF STORE SHIFT REGISTERS
LEADING EDGE OPTICAL
FROM OPTICAL TRAILING EDGE SCANNER
TRAILING EDGE OPTICAL
FROM GRAPHITE LEADING EDGE SCANNER
LEADING EDGE GRAPHITE 2 (MARKED BY 2 OR 3)
LEADING EDGE GRAPHITE 3 (MARKED ONLY BY 3)
FROM GRAPHITE TRAILING EDGE SCANNER
TRAILING EDGE GRAPHITE 2 (MARKED BY 2 OR 3)
TRAILING EDGE GRAPHITE 3 (MARKED ONLY BY 3)
FROM OPTICAL TRAILING EDGE SCANNER
FROM OPTICAL LEADING EDGE SCANNER
LEADING
TRAILING
EDGE OPTICAL
EDGE GRAPHITE 2
9 LIGHT TO DARK
2mS
SHELF STORE INSPECTION PULSE
STAMP
NO STAMP
EDGE 2d
GRAPHITE LEADING
EDGE 3d
EDGE 2d
GRAPHITE TRAILING
EDGE 3d
OPTICAL LEADING EDGE
OPTICAL TRAILING EDGE
BOTH REGISTERS MARKED THIS EFFECTIVELY ERASES ALL SIGNALS
LEADING EDGE 2d
LEADING EDGE 3d
LEADING EDGE 2d
LEADING EDGE 3d
NOTES:-
THE SYMBOLS USED ARE IN ACCORDANCE WITH BS 530 SUPPLEMENT 5
TWO POSITION TRIGGER
ABSENCE OF SIGNAL LOCKS GATE
GATE REQUIRING PRESENCE OF 'n' INPUTS FOR AN OUTPUT
AN OUTPUT SIGNAL PERSISTS FOR 'x' mS AFTER THE START OF AN INPUT SIGNAL
AN OUTPUT SIGNAL APPEARS 'y' mS AFTER THE START OF AN INPUT SIGNAL
GATE CANNOT OPERATE IF SIGNAL EXISTANT

Fig. 15. Schematic diagram of signal analysis

examine the signals from the letter at corners other than those in which a stamp is expected to be found. If a stamp signal is received while these other areas are passing the scanners then the letter cannot be faced with certainty by optical methods and all of the optical signals must be rejected.

A short-gap detector is fitted on each shelf to ensure that a diverter is not required to operate between two letters which are too close together. This short-gap detector makes use of the first two photobeams on the shelf which are spaced by $2\frac{3}{4}$ in: if the condition of the first photobeam changes from light to dark while the second one remains dark, then a short gap is indicated. In order not to allow a diverter to attempt to operate between two such letters and yet not misdirect the second letter, both of these letters must unfortunately be rejected. This technique is referred to later.

A letter which appears longer than $7\frac{1}{4}$ in is also rejected for fear that it is in fact two overlapping shorter letters. Detection of such a condition is effected with the first four photobeams on the shelf. If all four are dark at the same time it is due either to a long letter, two letters overlapping or two letters and a short gap: in this latter case the decision will have already been taken by the short-gap detector to reject the item. A switch is provided in the circuit to allow a fifth photobeam to be included in this long-letter detector in order to effect rejection of only those letters longer than 10 in. This facility will be used when the table is modified to handle longer letters, which are stacked separately by the segregation equipment described in the November issue.

3. *Synchronous Storage of Identified Signals (Shelf Stores)*

It is not practicable to attempt to compress the four scanners (optical and graphite versions of the leading and trailing edge scanners) into the space occupied by one letter. Consequently it is necessary to store the signals which have been allowed past the various scanner gates in order that the signals from each of the scanners originating from one letter may be compared, when all have been received, and not be confused with the signals from other letters.

Shift registers employing cold cathode triodes have been adopted to provide this storage. The shift registers are stepped once for every 2 in of movement of the belt, i.e. about 30 steps per second. This stepping of the shift registers is controlled by a photobeam which is interrupted by a disc, drilled appropriately, which is rotated by the letter-conveying belt.

There are six of these shelf stores on the top shelf, one for each of the conditions listed below:—

Detector	Signal Position	Type of Signal	Interpretation
Graphite	Leading edge	Single signal	2d. stamp
Graphite	Leading edge	More than one signal	3d. stamp or combination of stamps
Graphite	Trailing edge	One signal	2d. stamp
Graphite	Trailing edge	More than one signal	3d. stamp or combination of stamps
Optical	Leading edge	Standard	A stamp, no details
Optical	Trailing edge	Standard	A stamp, no details

Only four stores are required for the lower shelf because there is no need to count the graphite signals in this instance.

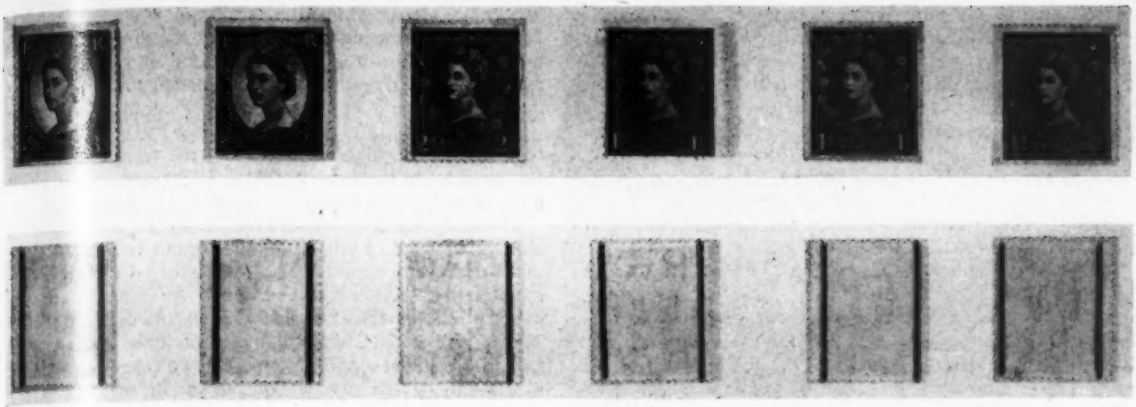


Fig. 16. Stamps with conductive lines produced by graphite-based ink

4. *Signal Analysis*

The signals, if any, that are passed to the shelf stores from the various scanner gates are fed into the shelf store shift registers so that they keep pace with the originating letter as it moves past the scanners. Stored signals therefore arrive simultaneously at the end of the stores as the letter reaches the end of the scanning shelf. The analysis of the separate pieces of information is then carried out on the basis that the graphite sensing is more reliable than the optical and if any graphite signal is recorded no regard is paid to any optical signals. Fig. 15 illustrates schematically how the analysis is made. If no graphite signals are recorded then optical signal stores are examined.

If graphite signals are recorded for both leading and trailing edge stamps, then it is not possible to face the item and it is treated as if it has no stamp. This facility is also used as a means of rejecting letters indicated by the long-letter and short-gap detectors as the detectors for these two conditions place their information on both the leading and trailing edge shelf stores, thus ensuring that no attempt is made to face the item.

The coincidence of optical leading and trailing edge signals on the same letter occurs far more frequently than with the graphite sensing, but as the graphite signals take preference in the interpretation circuits, rejection of a letter for this reason can only occur if no graphite signal has been recorded. This means of rejecting all optical signals without prejudicing any graphite signals is used in the picture postcard rejection circuit. If a picture postcard passes, the optical scanners may well be caused to signal both a leading and trailing edge stamp indication. If so, the picture postcard is then treated as if it has no stamp in so far as the optical scanning is concerned. Facing of such items may still, however, be performed if the stamp they carry bears a graphite mark.

The interpretation circuits decide, using the above criteria, to which of the five stacking boxes a letter should be directed. One of the four shift registers controlling the four stacking diverters is then marked according to which diverter is required to operate. If no shift registers are marked then no diverters operate and the letter passes to the fifth, 'no stamp', stack.

5. *Synchronous storage of analysed signals between analysing points and diversion points to faced stacks*

The shift registers, which transfer the signals from the analysing circuits to the diverter control circuit, employ the same cold cathode triode system as do the shelf stores and are shifted at the same rate, i.e. 30 steps per second. They carry the information in synchronism with the machine as do the shelf registers so that the signal reaches a diverter at the same time as the letter.

6. *Control of Diverters*

In order to relieve the shift register of the need to control the moment of operation of the diverter with extreme accuracy, the signal carried by the register is used only to prepare the diverter; a letter-detecting and guarding photo-beam, set approximately 2 in ahead of the diverter, is employed to cause the actual operation when the letter breaks the beam. This arrangement reduces the tight restriction on the permissible letter slip and position resolution required of the shift register, which are otherwise imposed by the small space between letters (commonly 3 in to 6 in) and the long distance of letter travel (up to 6 ft) over which the shift register must hold the information. A further facility given by the diverter control circuit is such as to cause the diverter to move only when it is necessary for the correct routing of a letter; this reduces the number of diverter operations by avoiding the need to restore the diverter after the passage of each letter.

Because the diverter is driven via a 2 : 1 reduction gear from a single-revolution clutch, there are no separate operate and reset circuits and successive operations of the same release magnet cause the diverter to move from one position to the other. This makes the use of a diverter direction detector necessary (another photobeam) to tell the diverter gate circuit which way the diverter is set and so allow the introduction of the above facility. The diverter gate is therefore controlled by three signals, one from the shift register, one from the guard beam and a third from the diverter direction detector. Disagreement between the order carried by the register and the diverter direction detector indicates that the diverter should be changed over.

The schematic diagram illustrates how the information relating to a letter is handled from the time a letter enters the second and final scanning shelf until it is diverted to a stacking box.

The plan view of the upper shelf shows the arrangement of the nine incorporated photobeams and the four stamp-detecting circuits. These beams are used to detect badly positioned letters and also to control gates which forward signals only when they have been obtained from 'stamp corners' as already described.

The monitor system of the graphite scanner that is positioned to detect stamps in the leading edge 'stamp corner' is taken as an example.

The first gate in this monitor requires the coincidence of two specific input signals before it will allow passage of any scanner signal: the two signals occur when number 8 photobeam is dark and number 9 is light, indicating that the leading edge of the letter is between the beams. While these conditions exist, a signal is passed to the next gate. This second gate will also forward an output signal at the coincidence of the two wanted input signals; one of which is received from the first gate and the other directly from the graphite leading edge scanner. An output from this second gate therefore implies that a conducting mark has been detected in the area where a stamp is to be expected and the graphite leading edge 2d. shelf store shift register is marked forthwith to show that a stamp of this category exists. The output from this second 2-gate is fed in two other directions as well as to the store shift register. It is fed in two directions to a further circuit which determines whether there is one or more than one conducting line. One of these signal outputs triggers a 5-millisecond delay circuit. This in turn, after 5 milliseconds, sets a second trigger which generates a signal that persists for 40 milliseconds and which is fed to a third 2-gate. If this gate receives two input signals (one via the delayed path and the other direct from the first scanner gate) at the same time, it will direct a signal to the graphite leading edge 3d. store to show that two or more conducting lines have been detected. The second line must occur more than 5 milliseconds after the first, and in the time allowed by the first gate (number 8 beam dark and number 9 light), since the interval of 40 milliseconds has been chosen to exceed the time the leading edge of the letter requires to pass between beams 8 and 9. This timing method rather than a counting method has been adopted to overcome the problem of one signal which runs into the second due to 'wrap round' of the letters on the scanning roller, thus making one long signal out of two.

The shelf store shift register is marked with information in such a position that the information is shifted to the end of the shift register at the instant the letter reaches the 9th beam. In breaking the 9th beam the letter causes a 2-millisecond inspection pulse generator to operate and to unlock the 2-position triggers at the end of each shift register. These triggers are then able, during the 2-millisecond inspection pulse interval, to take up a condition indicating whether or not information is stored in the related shift register. In the diagram (Fig. 15), the trigger indicates a stamp signal in the store if it is set in the upper state, and it indicates no stamp signal if it is set in the lower state.

The analysing gates forward output signals only when there is a coincidence of all the required input conditions, these inputs being so connected that they satisfy the requirements mentioned in section 3, sub-section 4. As either the presence of graphite signals or optical signals (as detected by the 2- or 4-gates respectively) may cause a letter to be directed to a 3d. stack, the outputs from these two gates are combined in a 1-gate which gives an output in the presence of any one incoming signal and passes the information to the appropriate diverter control shift register.

As already stated the diverter control shift registers are arranged to pass information to the diverters in synchronism with the letters. The system of operating the diverters has already been described, but Fig. 15 illustrates the system schematically. Associated with each diverter are two 2-position triggers. One is controlled by the shift register and indicates the direction in which the diverter should be set; the other trigger indicates the direction in which the diverter is actually already set. Two 2-gates look for a difference between these two triggers; if there is a difference a signal is passed through the 1-gate to the last 2-gate. The arrival of a signal from the letter leading edge detector at the last 2-gate completes the necessary input condition and sets the 10-millisecond trigger which energizes the diverter magnet.

Acknowledgment

The photographs accompanying this article are reproduced by courtesy of H.M. Postmaster General.

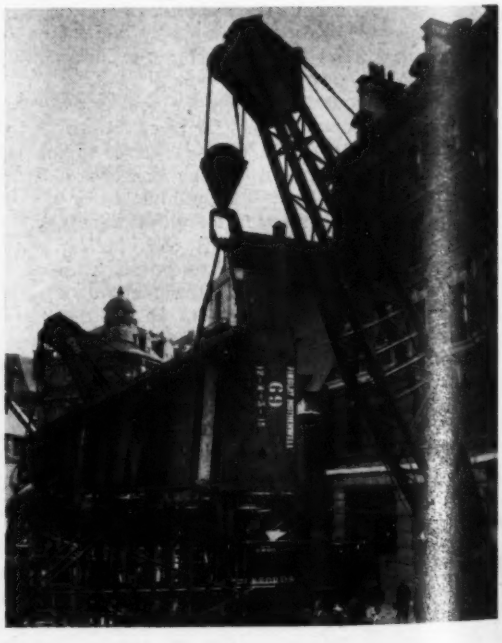
One of Pickfords' Week-End Jobs

Handling Very Heavy Girders for the Stoll Theatre Project

It is always fascinating to watch two cranes operating in tandem to raise or lower a heavy or bulky load, and on a weekday the spectacle caught by our photographer just off the Kingsway would have drawn a large crowd. The pictures, however, were taken on a Sunday morning, while Pickfords were doing one of their week-end jobs.

They had brought two welded plate girders, one of which is 75 ft long and weighs 23 tons, and the other 10 ft shorter and half the weight, from the railway goods yard at Camden Town to the Stoll Theatre site bounded by the Kingsway, Portugal Street and Sardinia Street, and were offloading them on to temporary scaffolding when our photographs were taken. Two lorry-mounted Coles cranes, one a 25-ton L2710 and the other an L2310 of 20-ton nominal capacity, were used to lift the girders off the transport vehicle, manœuvre them into position and lower them on to the scaffolding. The cranes are part of the Pickfords fleet and are based on the London area, where they spend their time on heavy contract work, travelling under their own power from site to site.

The girders handled that morning were the first consignment of five similar very heavy structural members that will be used in the redevelopment of the Stoll Theatre site. They will span the auditorium of the basement theatre and support the reinforced concrete structure of the office block above.



This 12-ton girder, and another 75 ft long and weighing 23 tons, was offloaded by Pickfords by means of two Coles cranes working in tandem

AUTOMATIC VALVE CONTROL

Limitorque equipment now made in Britain

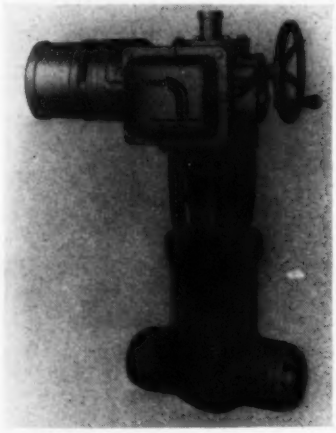
Under the terms of a recent agreement, the Limitorque valve control unit, of American design, is now being manufactured in the U.K. by Limitorque Valve Controls Ltd., a wholly owned subsidiary of Opperman Gears (Holdings), Ltd., of Newbury, Berkshire

Ten SMA2 Limitorque valve controls operating Darling 20-in series-150 wedge gate valves

LIMITORQUE is a fully automatic valve-actuating device which controls and limits the opening and closing of all types of valves. It can also be used for operating sluice gates and bulkhead doors.

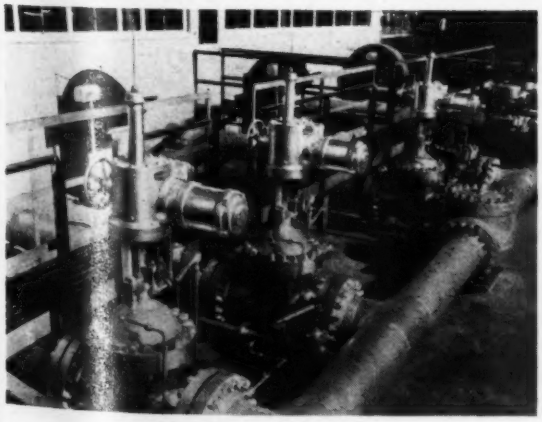
Limitorque eliminates the need for stand-by personnel to operate valves manually, and it is ideal for use where valves are inaccessibly situated or when emergency dictates rapid positive action. Limitorque units can be fitted to any size of valve in any position, and can also be adapted for use with existing hand-operated equipment merely by replacing the valve yoke by a simple yoke adaptor.

The valve can be actuated by almost any power source including electricity, air, hydraulic power and high-pressure gas.



A Limitorque weatherproof electric valve operator on a William Powell 6-in series-1500 wedge gate valve

A group of SMA0 Limitorque valve operators on Ludlow class 600, 12-in steel gate valves



Overload Protection

By limiting torque and thrust loads, the Limitorque valve control unit protects all operating parts from overload.

The importance of accurate valve seating has been fully recognized in the design of the Limitorque units. In the event of an obstruction being met whilst closing the valve, a torque limit switch automatically disconnects the source of motive power, thus preventing damage to valve seats, stem and discs. Seating may be adjusted to compensate for normal valve wear or other changing service conditions which may occur.

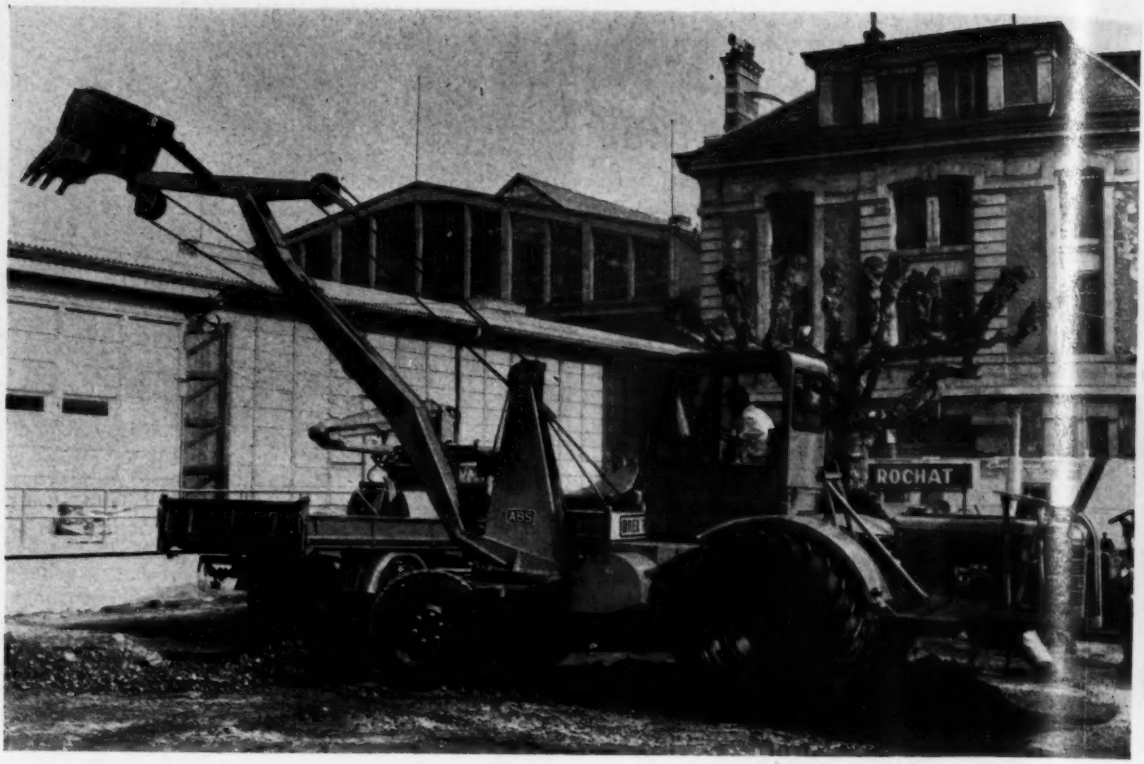
To produce a power-operated valve control with high torque and thrust capacities, high-efficiency precision gearing is used. The first reduction is by helical gear and pinion. These are of heat-treated alloy steel, hobbed and shaved for accuracy, while worm and wheel make up the second reduction and final drive. The worm is of alloy steel, hardened and ground for high efficiency and long life, and the worm wheel is made from high-tensile nickel bronze.

Hammerblow feature

The worm gear drives the valve-nut assembly through two lugs, this produces a hammerblow effect which allows the motor and gears to attain full speed before torque is applied to the valve stem. This feature ensures the freeing of sticky valves.

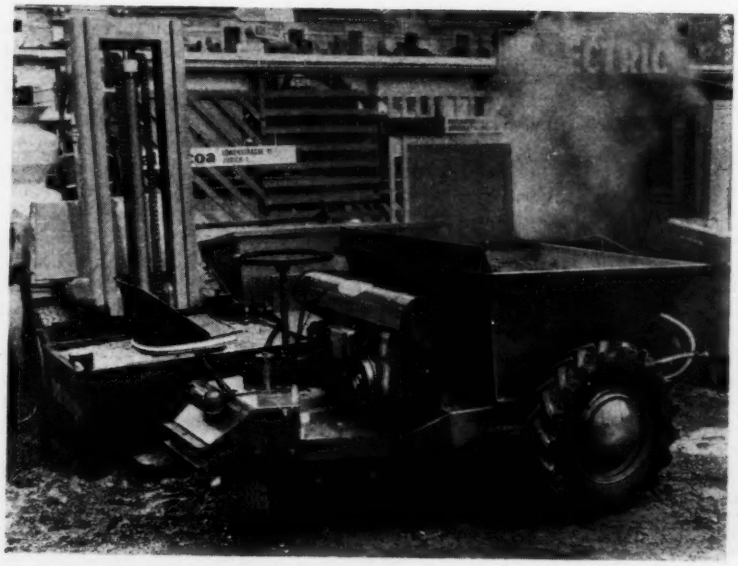
In the larger Limitorque units the hammerblow feature is applied to the hand wheel. In effect, this eliminates the possibility of the valve becoming frozen in its seating should there be a power failure.

The British company will manufacture strictly to the Philadelphia specification and design, so that the products they produce will be identical with the units successfully used in the United States over the past 30 years.



Universal excavator, model U 25, shown by AIMSA, of rue du Pré-Jérôme 21, Geneva

MATERIALS HANDLING EQUIPMENT ON SHOW AT GENEVA



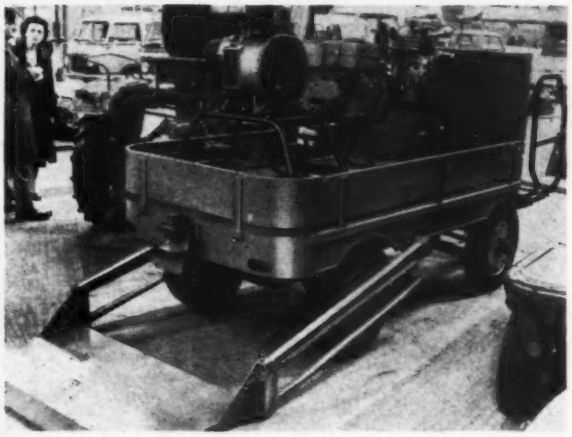
A considerable amount of space at the recent Geneva Motor Show (Salon International de l'Auto Genève) was devoted to materials handling equipment of many kinds. The following illustrations, taken especially for *Mechanical Handling* by our staff photographers, depict just a few of the machines on view.

Capable of carrying a load of 1,000 kg (2,200 *lb*), *this dumper has four forward and four reverse speeds. It was shown by Société Metalex, 3 rue des Eaux Vives, Geneva*

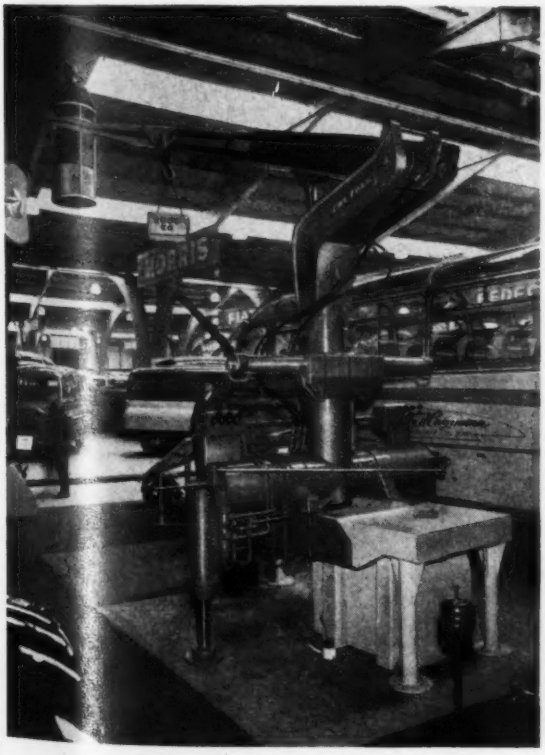
This tractor-mounted machine can be fitted with a wide range of dredging, excavating, loading and lifting jibs. It was displayed by AIMSA, rue du Pré-Jérôme, Geneva →

Loading of bulk materials on to conveyors is but one of the jobs that can be facilitated by this electrically powered hand-guided scraper shown by Wieger G.m.b.H., of Neuss-Rhein, Germany ↓

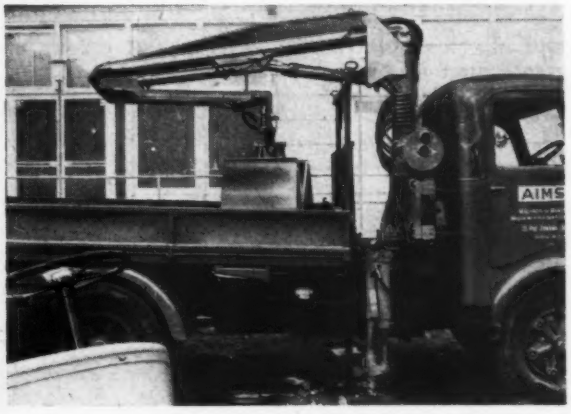
The 'Hydrocar' platform truck, fitted with an additional rear-mounted lifting platform to aid the transfer of goods from the truck to other vehicles, or vice versa. Manufacturers are Güldner-Motoren-Werke, Aschaffenburg →



Suitable for lorry-mounting, this machine can be used either as a loading crane or as a high-lift working platform. It was shown by Ernst Wirz, of Uetikon a/See, Switzerland ↓



This 'Atlas' lorry loader, equipped with grab attachment, was among the products shown by AIMSA, 21 rue du Pré-Jérôme, Geneva ↓



SPEEDY VEHICLE LOADING AT NEW PAINTS WAREHOUSE

New counterbalanced dock ramps need no power supply

1

2

Fig. 1. The arrangement of the counterbalance weights beneath the ramp makes it easy to raise or lower the platform by means of lifting handles. When not in use, the handles lie flush with the surface

Fig. 2. A Lansing Bagnall pedestrian-controlled pallet transporter uses the ramp to load a lorry at the new warehouse of Lewis Berger (Great Britain), Ltd.

TO SPEED the loading of road vehicles, counterbalanced dock ramps of unusual design have been installed at the 75,000 sq. ft. warehouse of Lewis Berger (Great Britain), Ltd., at Chadwell Heath, Essex. Three ramps are at present in use, but provision has been made for the installation of a further five later on.

Established in 1760 at Homerton, Lewis Berger (Great Britain), Ltd., are well known for their wide variety of paints, varnishes, dry colour, thinners and allied products. Their new warehouse is fully palletized, the paints, etc., being brought from the production departments by a 'Towveyor' under-floor chain conveyor which tows small wheeled trolleys in a continuous circuit. The trolleys are detached from the conveyor as required, and the loads stacked in Gascoigne tubular pallet racks by Lansing Bagnall reach trucks.

Outgoing orders are assembled on to 3-ft × 3-ft pallets in loads of 15 cwt to 1 ton and taken to the loading bay by Lansing Bagnall pedestrian-controlled pallet transporters. These load the pallets on to road vehicles for distribution.

Designed and supplied by G. Hunter (London), Ltd., the new dock ramps have been developed especially to meet the need for an inexpensive unit which will cater for a wide range of different lorry-loading heights, yet be completely independent of any form of power supply. Each ramp is absolutely self-contained, and requires no hydraulic or electrical power for its operation.

At the Lewis Berger warehouse, the ramps have been installed in recessed pits provided in the new loading dock, but in existing docks, where it would be desired to avoid the expense of excavation, the ramps could be installed so that they extended outwards from the face of the dock. If required, they could be constructed as mobile units capable of being moved to the most convenient position for loading or unloading at any given time.

The deck of each ramp is made from a lightweight manganese alloy, and has counterbalance weights suspended beneath it so that it can be easily raised or lowered by hand. The space-saving arrangement of weights and levers is indicated in the side elevation, Fig. 3. It will be noted that none of the mechanism extends beyond the surface area of the ramp deck itself.

The ramp is designed for a maximum working load of 6 tons. When not in use it can be locked to withstand roll-over loads by means of retractable pins at either side. With a platform size of 10 ft long by 4 ft 6 in wide the ramp has a working range extending 15 in above and below the dock-surface level.

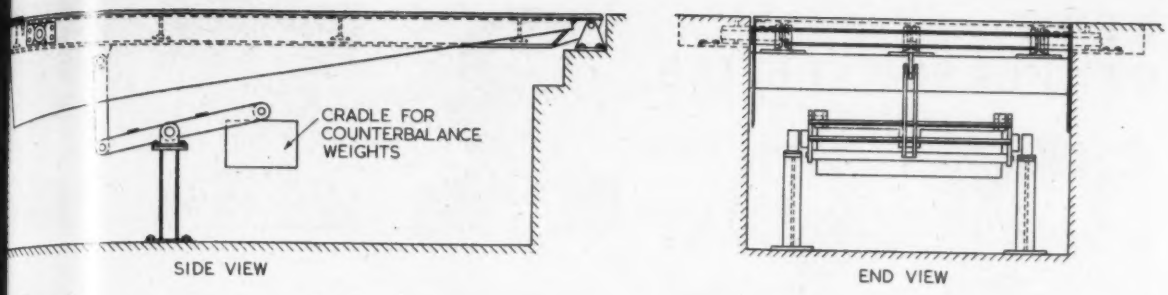


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Fig. 3. Side and end elevations of one of the new ramps

Fig. 4. Close-up showing one of the retractable pins by means of which the ramp may be locked to withstand roll-over loads

Fig. 5. Another view of the pallet transporter loading a road vehicle with palletized paints

Acknowledgment

We are indebted to the directors of Lewis Berger (Great Britain), Ltd., for allowing us to see the ramps in operation and for permission to take the accompanying photographs.

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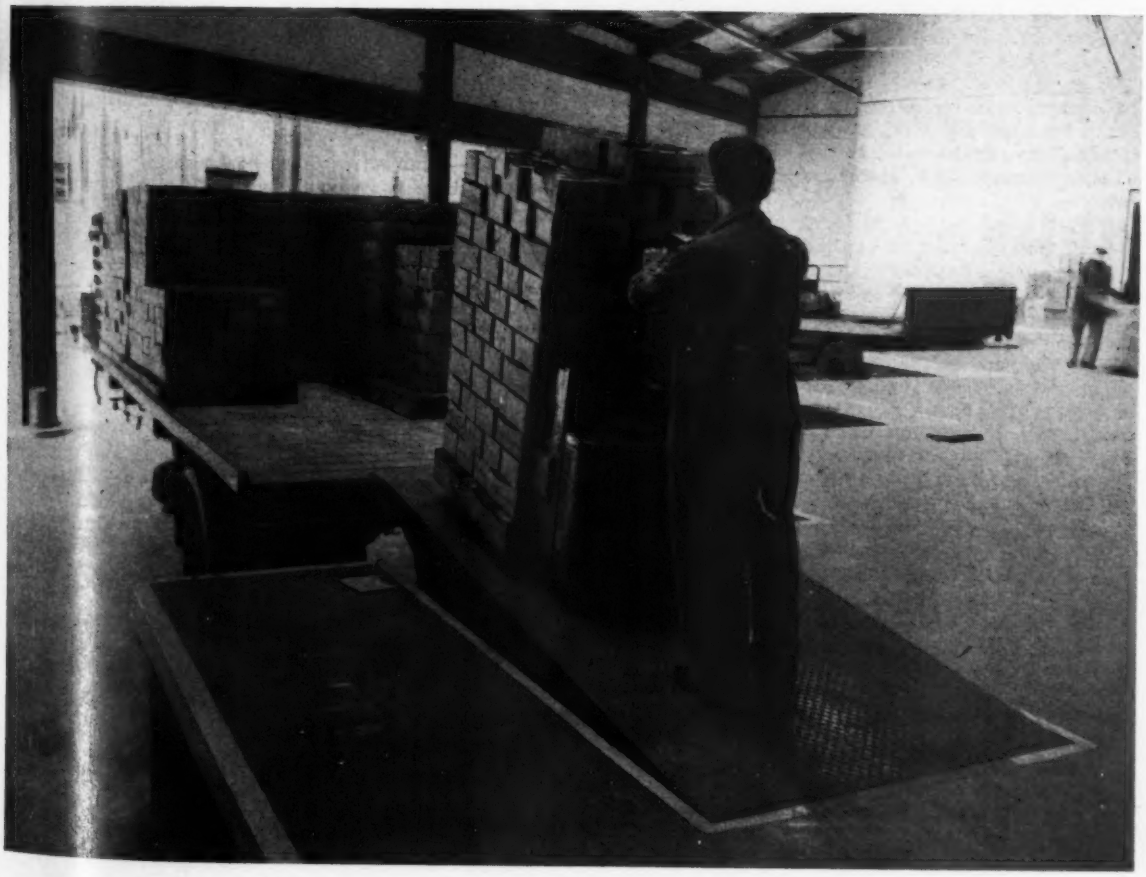


NEWS OF PERSONALITIES

A. Harold

R. Edwardes

A. Harold, A.F.R.Ae.S., a director of Conveyancer Fork Trucks, Ltd., and chief engineer of Electro-Hydraulics, Ltd., has been appointed to the board of the latter company.

R. Edwardes, A.C.W., A.C.W.A., director and secretary of Conveyancer Fork Trucks, Ltd., and secretary of Electro-Hydraulics, Ltd., has been appointed to the board of the latter company.

T. C. Wright, director and works manager of Electro-Hydraulics, Ltd., has been appointed to the board of Conveyancer Fork Trucks, Ltd.

F. Perkins, Ltd., the Peterborough diesel engine company, announce the appointment of two new directors. They are **J. G. Dawson** (director of engineering) and **Geoffrey Smith** (director of production).

Martonair, Ltd., manufacturers of pneumatic equipment, have ceased to be represented in the North-West by R. G. Smith (Accrington), Ltd., and have appointed two new technical representatives in this area: **G. Parfett,** Liverpool, Chester, Preston; **C. F. Holding,** Leeds, Bradford, Wakefield.

F. B. Holt, M.I.E.E., a local director of Higgs Motors, Ltd., is paying a business trip to Africa and will be calling on agents and distributors and investigating the possibilities of developing new outlets.

His journey will include visits to the Sudan, British East Africa, Northern and Southern Rhodesia, Portuguese East Africa and the Union of South Africa. This territory is not new to Mr. Holt—he made a similar journey two years ago.

J. Douglas Elstone, sales manager (agricultural and industrial divisions) of the Dunlop Rubber Co., Ltd., Birmingham, has accepted an appointment with David Brown Industries, Ltd., tractor division, Meltham, Yorkshire, as director of marketing. This is a new post which has been created to co-ordinate the expanding home and overseas sales of tractors and agricultural machinery manufactured by the Yorkshire company and its subsidiary, Harrison, McGregor & Guest, Ltd., of Leigh, Lancashire.

Exactor, Ltd., of Exactor Works, Church Way, Edgware, Middlesex, announce the appointment of **A. A. Haining** as their sales manager.

R. W. Honeywell has recently been appointed representative for the Leicester area by Crofts (Engineers), Ltd.

Westinghouse Brake & Signal Co., Ltd., announce that

T. C. Wright

J. G. Dawson

Geoffrey Smith

F. B. Holt

J. Douglas Elstone

R. W. Honeywell

George William Dunkley, O.B.E., has been appointed a director of the company.

K. L. Coombs has been appointed divisional manager of Webb Conveyors & Automation, Ltd., of the Airport Works, Rochester, Kent, one of the companies in the Elliott-Automation Group. This company manufactures and sells the many different types of conveyor systems developed by Jervis B. Webb Company of Detroit.

Before joining the Elliott-Automation Group, Mr. Coombs was with Paterson Hughes Engineering Co., Ltd., and the New Conveyor Co., Ltd., and spent some considerable time when with Standard Telephone & Cables, Ltd., in charge of the design and development of plant for the process industries.

The appointment of **C. A. McLaren** as works manager has just been announced by Dewhurst & Partner, Ltd., electrical control gear manufacturers, of Hounslow. Mr. McLaren has served with the company for 30 years, and is well known in the electrical control industry.

OBITUARIES

We regret to report the death of **G. A. Adams,** sales manager engineering services division of Geo. Salter & Co., Ltd., West Bromwich.

We have to report the death of **T. Marshall** (Clarke, Chapman & Co., Ltd.). Mr. Marshall served a five-year apprenticeship with Messrs. Clarke Chapman & Co., Ltd., Gateshead, and followed this with seven years in the Merchant Navy, leaving the latter after having gained a chief engineer's ticket. After a short period as a draughtsman he joined Ocean Accident and Guarantee Corporation as a boiler and refrigerator inspector and he worked for this corporation for 18 years. In 1944 he returned to Clarke Chapman & Co., Ltd., as an assistant technical manager in their London office, which position he held until his decease.

J. Brook, A.M.I.P.E., works director of Dewhurst & Partner, Ltd., died at his home recently, aged 60.

Mr. Brook began his career with Marryat & Place, Ltd., and served during the 1914-18 war in the Royal Marines. He was well known in the electrical control equipment industry and played a large part in the development of new production techniques.

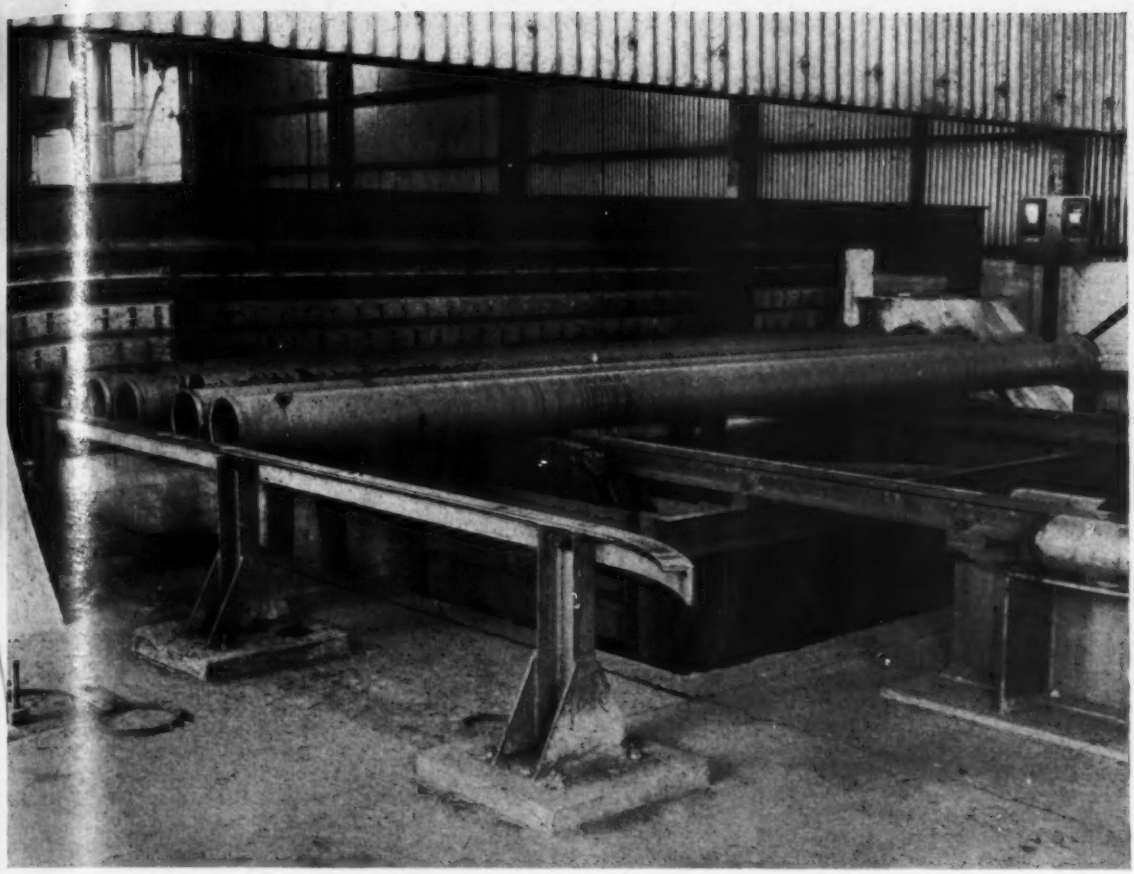
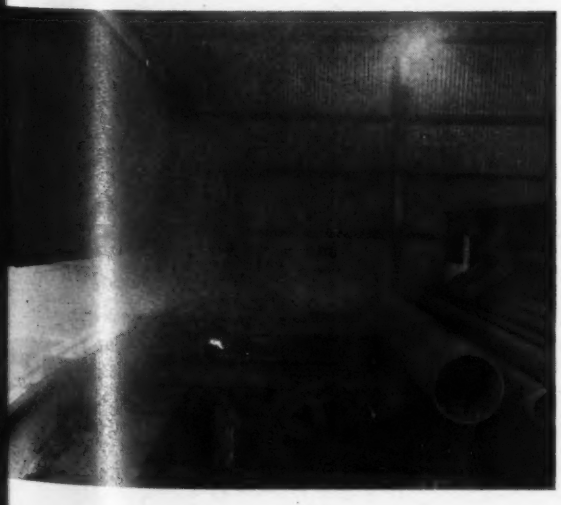


Fig. 1. The first of the twin-slat conveyors, taking batches of cast-iron pipes into the preheating oven. The oven door is covered with an asbestos flap

HANDLING CAST-IRON PIPES THROUGH FINISHING PROCESSES

By a Staff Contributor



FOR HANDLING cast-iron pipes through finishing processes comprising preheating and dipping in Dr. Angus Smith solution (bitumen), two twin-slat conveyors have been installed at the works of The Staveley Iron & Chemical Co., Ltd., near Chesterfield. The conveyors form part of an extension to the Metal Spun Pipe casting plant where special machines are installed for producing pipes of up to 12 in dia for water, sewerage, gas and similar mains services.

From the main manufacturing plant the pipes are rolled along gantry rails at waist height, passing through various grinding, scrubbing, inspection, weighing and hydraulic testing processes. They then arrive at the first of the twin-slat conveyors, which takes them in batches through a preheating oven operating at a temperature of 500 deg F.

The conveyor may best be visualized as two separate parallel chain conveyors, each having very narrow slats

Fig. 2. This illustration shows pipes emerging from the oven and being delivered to the dipping rig on the left

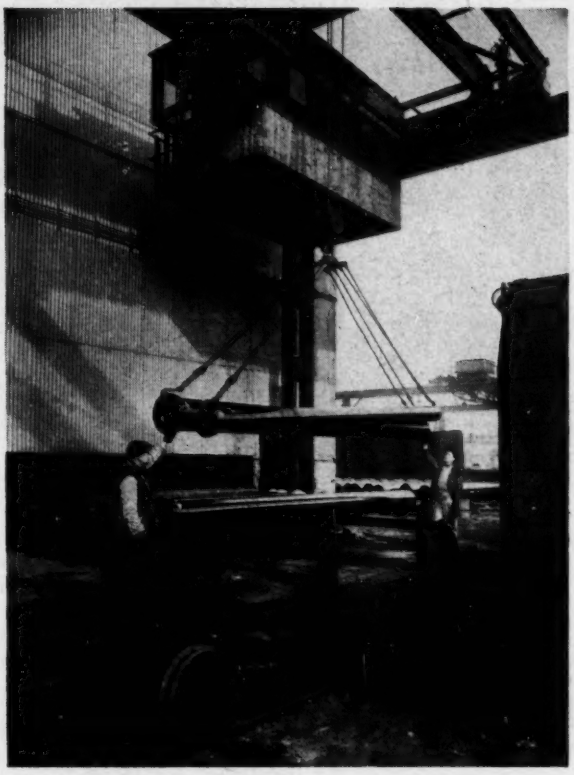


Fig. 5. A Heywood 3-ton s.w.l. crane removes finished pipes from gantry rails for loading on to road or rail vehicles or putting out to stock

as seen in the illustrations, and both being powered by the same drive unit. The pipes lie across the two conveyors, which operate as a single unit taking the pipes into the oven (Fig. 1).

The track width (i.e. the distance between the two lines of slats) is 9 ft 6 in centres. Cleats are fitted to the chains at intervals to aid the batching of the pipes and to control the intermittent action of the conveyor. These cleats are spaced at 7-ft 9-in batching intervals with a 1-ft 6-in gap between each batch. The permissible load on each batching section is 4 tons, total permissible load on the conveyor being 24 tons.

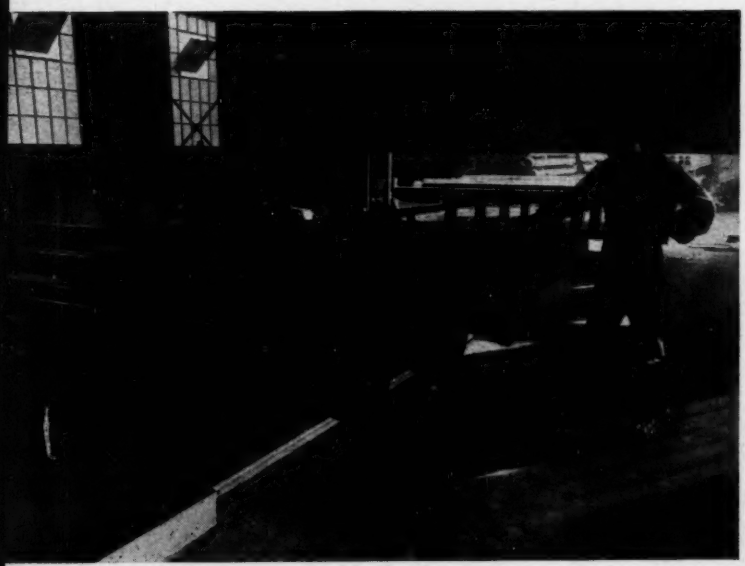
The oven conveyor is powered by a 5-h.p. motor and operates at an intermittent speed of 10 ft/min. It is equipped with Kirkham automatic lubrication. The length of the conveyor between sprocket centres is 51 ft 4 in and there is a fall of 4 in along the conveyor length. The drive from the motor is taken via a 6-in Radicon gearbox and chain drive to spur reduction gearing driving the 30-in dia conveyor sprockets.

Upon emerging from the oven, the conveyor delivers the pipes on to a special dipping rig (Fig. 2) designed and built by the company's Foundry Engineering Department. This dips the pipes into hot Dr. Angus Smith solution and tilts them for draining.

After passing through the dipping rig, the pipes are delivered on to the second of the twin-slat conveyors (Figs. 3 and 4). This takes the pipes on to gantry rails at the end of the building where a Heywood 3-ton s.w.l. overhead travelling crane loads them direct on to road or rail vehicles or puts them out to stock (Fig. 5).

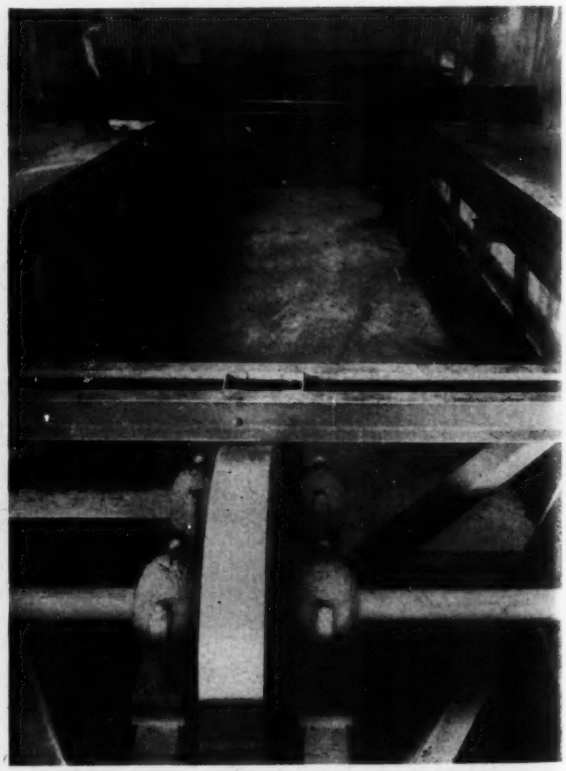
The second twin-slat conveyor is basically similar to the oven conveyor but is slightly shorter, having a length between sprocket centres of 36 ft and a total load-carrying capacity of 18 tons.

Both conveyors were designed and installed by Herbert Morris, Ltd., of Loughborough.



ABOVE

Fig. 3. After dipping, the pipes are delivered on to the second of the twin-slat conveyors, where irregularities in the bitumen coating are smoothed away by brushing, as seen here,

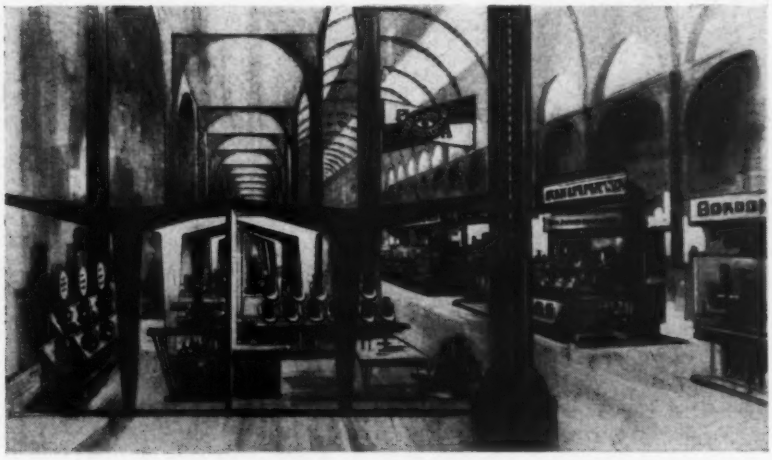


RIGHT

Fig. 4. Another view of the second of the twin-slat conveyors, with pipes emerging from dipping rig in background. The conveyor's spur reduction gearing is seen in foreground

EXHIBITION LAUNCHED FOR AIR AND OIL HYDRAULICS

Macfarlane Watson Announce Formation of Fluid Power Association



At a press conference held by Macfarlane Watson, Ltd., 36 Beauchamp Place, London, S.W.3, to inaugurate The Pneumatics & Hydraulics for Industry Exhibition and Convention, D. I. Macfarlane told reporters of the industry's rapid growth. 'Whereas', he explained, 'the Index of Industrial Production shows an increase of 2½ per cent., that of the pneumatic and hydraulic control industry is in the order of 5 per cent, the latter being a conservative figure'. Industry, he pointed out, was awakening gradually to a fuller realization of the potentialities of these media.

An Essential Function

Undoubtedly the potentialities are immense. Air and oil, with their smoothness and infinite variability, are the control engineer's ideal means of transmitting power, and control engineering is the craft and science of the future. Already, the importance of the actuating function is generally recognized and the instrument makers, electrical and electronics engineers, and toolmakers, have made a concerted effort to further their joint interests in this sphere. They have organized first an instruments, electronics and automation exhibition and then an electronic computer exhibition, both of which were well supported from the outset.

In promoting a pneumatics and hydraulics exhibition, Macfarlane Watson are performing the essential co-ordinating function that will serve the joint interests of these associated industries and the general development of control engineering. In this, they are doing a very great service to the control engineer, by centralizing his sources of information on the best means available to him of transmitting the power he has actuated by electronic or other automatic devices.

Formation of Fluid Power Association

The official co-ordinating body will be the Fluid Power Association, which will hold its inaugural meeting on the last day of the exhibition in the Convention Hall at Alexandra Palace. This venue was chosen for a number of reasons, which include such facilities as free parking for 4,000 cars and 'first-class catering at truly moderate prices', to quote the words of the organizers. Over half a million pounds have been spent recently on rehabilitating the interior of the building, and the layout has been designed to cater for the needs of large and small exhibitors.

Admission will be free, by ticket only, from October 12th to 16th, 1959, 10 a.m. to 6 p.m. Noon on October 12th has been fixed for the official opening, and the convention will be in session from 10.30 a.m. to 12.30 p.m. on the first four days of the exhibition.

Much interesting auxiliary equipment for mechanical handling systems will be on show, and provision is made for it to be seen in working demonstrations in the outside exhibition area. Weather permitting, visitors will no doubt wander from there into the Italian gardens and enjoy the flavour of a Continental exhibition.

Newly developed Simon 'Sonic' system provides a more stable and versatile method of pneumatic conveying than is available under conventional arrangements

AN IMPROVED SYSTEM OF PNEUMATIC CONVEYING

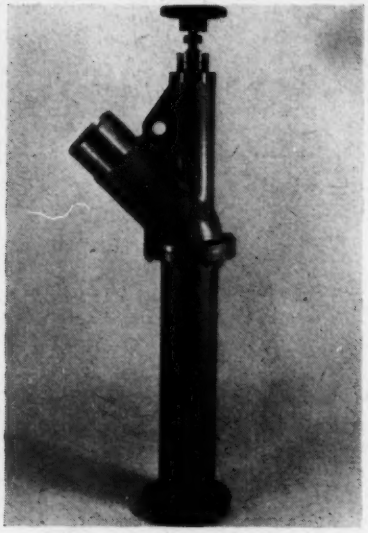


Fig. 1. The latest Simon 'Sonic' valve, with variable throat

DETAILS have been received from Henry Simon, Ltd., Stockport, of the Simon 'Sonic' Conveying System, which is now being installed in factories in Great Britain and overseas. This new patented method of pneumatic conveying has been subjected to prolonged and exhaustive testing and is claimed to be far superior to current conventional methods.

When materials are conveyed by orthodox pneumatic systems between different parts of a plant, it is necessary to provide a separate compressor for each blowing line, for if several lines are powered from a single compressor the air tends to take the path of least resistance, and any lines that are heavily loaded are liable to be bypassed and to become blocked. The use of individual compressors has many disadvantages, such as the reduced power factors and efficiencies resulting from the multiplication of driving motors, and the mounting costs of installation and maintenance.

Investigating this problem in their research laboratories at Cheadle Heath, Simon scientists sought for a valve that, when installed in a blowing line would keep the resistance of the line constant irrespective of the load. A system in which such valves were incorporated would permit any number of lines to be powered from one compressor without any interaction. The valve itself must be simple, reliable, economical and automatic.

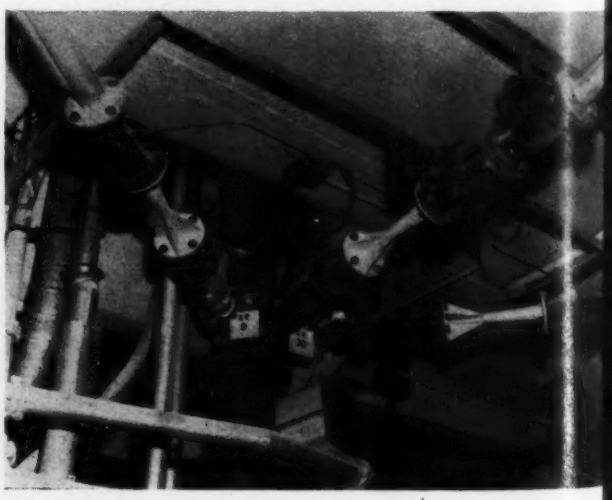
To meet this specification, the Sonic valve was developed. It consists of a convergent-divergent nozzle so proportioned that the air passing through it reaches the velocity of sound, and is based on the well-known thermodynamic principle that when the velocity of gas through a constriction is equal to the velocity of sound, the mass-flow remains constant irrespective of downstream resistance. With a Sonic valve interposed between a loaded line and a compressor, a pressure-wave travelling towards the compressor as a result of a load-change is halted at the valve throat—since the wave-velocity of propagation is exactly equal to the opposing air velocity. In other words, the Sonic valve introduces a sound-barrier between the compressor and the varying line-resistance.

Though the principle was justified, it was found that a simple orifice construction introduced a high pressure-loss, which was completely unacceptable. Further research was devoted to developing a low-loss nozzle of the valve shown in Fig. 1. By careful selection of the profile and special attention to the surface finish during manufacture, the loss was reduced to a negligible proportion. Fig. 3 illustrates the effects of good and poor finish. Further, the loss was found generally to be more than compensated by the gain in efficiency achieved by using compressors that would be unsuitable for single-blowing lines of the conventional type.

This system is said to be inherently more stable and versatile than those in which each line is powered by its own compressor. Whereas in the multi-compressor system, due to compressor characteristics, the air-flow in the lines decreases with increased load, the air-flow through the Sonic valve remains constant.

Simon engineers have recently installed the first Sonic conveying system; one, illustrated in Fig. 2, is working in a Liverpool biscuit factory and others are in course of erection.

Fig. 2. Sonic valves in a bulk handling system installed by Simon at the Liverpool bakery of William Crawford & Sons, Ltd.



3a 3b 3c

Fig. 3. Shadow photographs, reproduced by courtesy of R. P. Fraser from a paper published by The Institution of Mechanical Engineers (Proc. I.Mech.E. 171, 16. Jan. 1958), showing how small imperfections in nozzle profile can cause shock-waves

(a) Smooth flow resulting from well-finished nozzle

(b) and (c) Waves produced by badly finished throat and surface irregularities in the divergent section

In these illustrations, all the blowing lines are powered from a central compressor installation and the whole plant can be controlled from a central control room. Compared with a conventional system, the Simon Sonic conveying system gives lower initial and running costs, simplified maintenance, and great flexibility in dealing with variations in conveying rates.

The system has been patented in all major industrial countries. It is reported that wide interest is being shown in this new development, which promises to widen the scope and application of pneumatic conveying systems.

The valve is made of aluminium. It is fitted with an adjustment by which the flow can be preset to any desired value, which is then held by the valve regardless of load-changes. This feature obviates the need for a range of valves, and allows the system to be adapted to any future flow-changes.

Quick Costing Method for Handling Projects

Summary of an article by SV. Nordby Knudsen

It is always a convenience to be able to make a quick estimate of the costs of using a specified equipment, and to express the result in a standard form for comparison with the costs of other items. A simplified method* has been developed for this purpose that is easy to learn and involves only mental arithmetic or calculations that can be made on the edge of a newspaper. It is based on the fundamental stipulation that new equipment shall pay for itself within a reasonably short period. The steps are these:

1. Assume that the total purchase cost must be recouped within two years. It is convenient for purposes of calculation to express this period as 100 weeks and very often materials handling expenses are related to the weekly wages bill.
2. Hand trucks and other simple types of equipment, and gravity and powered conveyors, can be considered without regard to running expenses such as power, repairs and maintenance. Therefore, the minimum weekly profit earned by the equipment must be 1/100 of the purchase price. This may be called the *two-year marginal profit*.
3. Where fork lift trucks and similar power-consuming equipments are concerned, allowance must be made for running expenses. The minimum weekly profit will then be 1/100 purchase cost + running expenses.

A case-study has proved that one fork truck moving palletized goods over a distance of 20 m did the work of 16 men without mechanical assistance, or 11 men equipped with hand trucks. Expenditure on wages amounted to $16 \times 5 \times 10 = 800$ kr., in the first example, and $11 \times 5 \times 10 = 550$ kr., in the second.

Thus, by using a fork truck for as little as 10 hours a week, an advantage could be gained. In these calculations, additional sources of profit, as for example a reduction in lorry-loading time, have been disregarded.

*Any reader wishing for a description of this method is invited to apply to the author, at Ordrupvej 47A, Copenhagen-Charl, Denmark (quoting the reference SNK-ref. 41-00, Notat 5). The data will be forwarded free of charge, and without restrictions as to use.

REVIEW OF NEW EQUIPMENT

A 'Mono-Rail' transporter in operation on the St. Albans by-pass. It is fitted fore and aft with concave plates to deal with the surge of concrete on steep gradients

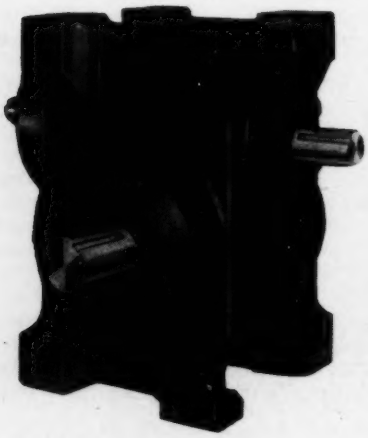
WORM AND HELICAL GEAR UNITS

The primary feature of two new types of gear unit announced by Crofts (Engineers), Ltd., Bradford 3, Yorks, is their adaptability to a wide variety of mounting positions, shaft dispositions and speed-reduction ratios. Known as the Crofts 'Universal' worm-reduction and helical gear units, they are of basically similar standardized design, having a single type of gearcase cast with integral feet.

There are three types of worm gear unit: standard (worm under wormwheel), inverted (wormwheel under worm) and vertical (wormshaft horizontal, wheelshaft vertical). Up to 50 mounting positions are possible with different arrangements of input and output shafts. Modification from one assembly to another is by interchange of oil fillers, and drain and level plug positions. Either right- or left-hand assembly is possible by removing the fan and cowl and replacing them on the opposite end of the wormshaft. Sizes available have 4 in, 6 in and 8 in centres for powers fractional to 50 h.p., and stock ratios of 5:1 to 70:1. Smaller and larger sizes up to 14 in centres will be available shortly. The units can also be supplied in motorized form.

The helical gear units are also adaptable to any installation in any mounting position and for any combination of gears or shaft arrangement. The gears are single helical throughout, give a wide range of ratios, with single, double or triple reduction gear trains, and with parallel input and output shaft dispositions, or are available as right-angle drives, using spiral bevel gears for the first reduction. Regardless of size or gear combination, input and output shafts are in the same horizontal plane, and for each size of unit are in all cases dimensionally in the same disposition to each other. The units are supplied in a wide range of ratios and with outputs up to 500 h.p. Smaller motorized units will also be available.

A standard Crofts 'Universal' worm reduction gear unit



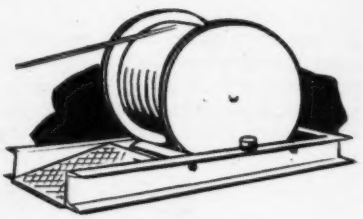
HYDRAULIC MONO-RAIL TRANSPORTER

The latest 'Mono-Rail' system as used on building and civil engineering construction sites is the hydraulic version built by Road Machines (Drayton), Ltd., Horton Parade, West Drayton, Middlesex. It incorporates all the advantages of the earlier system, operates with the same rail, stands, points etc., is likewise partly automatic and travels at 300 ft/min.

It has a B.S.A. 4½-h.p. petrol engine, though for overseas use other types can be fitted. This is direct-coupled to a gear-type hydraulic pump with single lever-operated control valve of special design. With the lever in the forward or reverse position, the fluid is directed to two gear-type motors driving the two rail wheels of the power wagon and coupled in series to avoid the differential effect of running in parallel. With the lever in neutral position, the fluid is returned to the reservoir.

Mounted on the rear motor shaft, the brake has twin shoes opened by a small hydraulic ram at a pre-determined pressure. When the control valve is thrown into neutral by the automatic stop or hand lever, the pressure drops and two springs apply the brake. A patented over-run brake checks the speed downhill, preventing an increase, even on a 1 in 8 gradient. As the power wagon tends to over-run the engine, the hydraulic pressure drops, allowing the brakes to be applied with effect also on the front rail wheel. Should a pipe be damaged and fail, the brake would immediately stop the unit.

Compared with the original model, the new version, with its two-wheel drive, has a much improved performance enabling it to climb a 1 in 9 instead of a 1 in 12 maximum gradient, or 1 in 18 instead of 1 in 15 with a trailer. The transporter will pull two trailers on slight gradients up to 1 in 30, and has a better performance also on a wet rail. The hydraulic layout dispenses with gearbox and clutch, with consequent reduction in maintenance costs.



Crowther cable drum roller

CABLE DRUM ROLLER

For holding cable, wire and other drums so that they can be easily rotated for unwinding, Crowther drum rollers have many applications and are made to cover a wide range up to very large sizes. The rollers are mounted on ball bearings across a channel-section steel frame fitted with a ramp to facilitate loading and unloading. The rear roller can be positioned to accommodate drums of different diameters, and the other can be locked against turning that would hinder the unloading operation. The roller stand can be used anywhere on a level floor without fixing, and the smaller sizes can be readily handled by one man.

The makers are Crowther, Ltd., Britannia Works, Thurmaston, Leicester.

(*continued on page* 301)

NEW DAVID BROWN TRACTOR

The suggestions and field experience of numerous farmers at home and abroad are stated to have been incorporated in the design of the new David Brown 950 tractor.

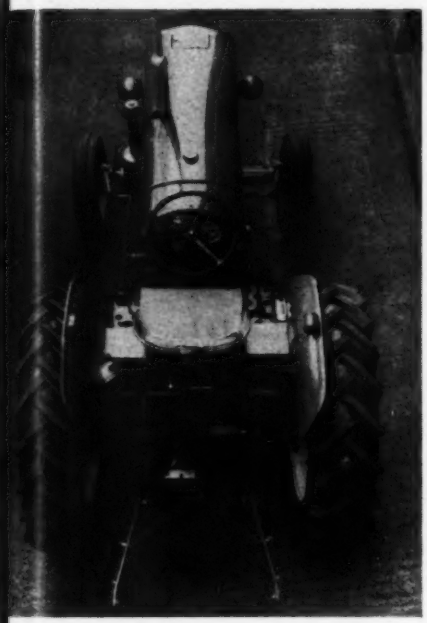
Prior to the introduction of the new machine, intensive reorganization was carried out at the Meltham factory, which is now equipped for greater and more efficient tractor production.

Powered by a new high-efficiency diesel engine developing 42 b.h.p., the 950 is reported to have the working capacity of a big tractor, but with a lower fuel consumption than many smaller, less-powerful machines.

A twin-range gearbox gives six forward and two reverse ratios, providing a forward speed-range of up to 13·1 m.p.h.

Further details may be had from The David Brown Corporation (Sales), Ltd., Tractor Division, Meltham, Huddersfield.

David Brown 950 tractor



LOW-COST OFF-ROAD EARTH MOVING

First introduced in this country at the last Public Works Exhibition, the Shawnee-Poole earth-moving system was developed by H. G. Poole and Partners Rhodesia (Pvt), Ltd., and is manufactured by Steel Fabricators (Cardiff), Ltd., Pengam Road, Cardiff. It enables a relatively light tractor to haul a high payload under the most adverse off-road conditions by suspending the load below the tractor and ahead of the rear axle. The tractor's front wheels are thereby held firmly on the ground at all angles of relative movement between tractor and towed unit, while ensuring maximum traction of the tractor's driving wheels. By use of the Shawnee-Poole coupling it is claimed that a 50-h.p. tractor can haul a 10-ton payload in a rear dumper while maintaining mobility and manœuvrability.

To shorten the overall length of the two units as much as possible, the front end of the dumper frame is goosenecked. Connection to the tractor back axle is by means of a forked drawbar whereby the load is equally divided and applied close to the wheels, greatly reducing the bending moment on the axle housing.

CONVERTIBLE SALVAGE CRANE

The HF convertible salvage crane described on page 176 of our March 1959 issue is manufactured by Harvey Frost & Co., Ltd., Bishop's Stortford.

SIEVING AND STRAINING SCREEN

A new high-speed sieving and straining machine has been developed by Russell Constructions Ltd., Russell House, Adam Street, Adelphi, London, W.C.2. Measuring 3 ft across the screen, the 'Invicta' has a high output performance in its application

The Russell Invicta sieving and straining machine

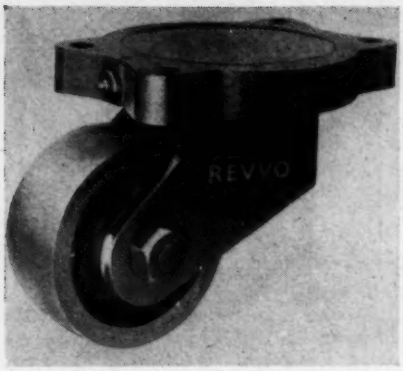
to both dry sieving and liquid separation. Running at 3,000 r.p.m., it passes nearly 10 tons of powders per hour and handles liquids at rates of up to 12,000 gal/hr. In the design of this latest Russell production interchangeability of parts, ease of cleaning and maintenance, silent operation and reliability have been considered.

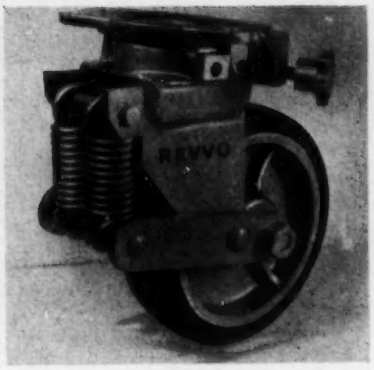
LOADING SHOVELS WITH AUTOMATIC TRANSMISSION

The 'Loadmaster' loading shovels produced by the Chaseside Engineering Co., Ltd., Hertford, Herts, are now available with automatic transmission and torque converter units manufactured by Brockhouse Engineering, Ltd. The installation of these units reduces the number of foot controls to two, the brake and accelerator. The gear lever is replaced by a forward and reverse shift lever. This simplification of controls reduces the time taken for a full operating cycle as well as reducing operator fatigue. The torque converter proportions the power to meet the load conditions and reduces shock loads to the engine and transmission. Other driver aids on the 'Loadmaster' include power-assisted steering and a comfortable weatherproof cab.

Application of the Shawnee-Poole system of coupling a goosenecked dumper to a tractor, permitting three-plane articulation and 110-deg turning angle

The Chaseside Loadmaster 700 loading shovel fitted with Brockhouse automatic transmission and torque converter





New additions to the range of Revvo castors (left) LT type with 6-in P.C.D. ball-bearing swivel; (centre) sprung castor with 18-in rubber-tyred wheel and swivel lock; (right) pressed steel type available with 6-in or 8-in wheels

NEW REVVO CASTORS

A number of additions to their range of castors is announced by The Revvo Castor Co., Ltd., Revvo Works, Old Ford Road, London, E.3. Two new series of extra-heavy-duty trailer castors, designed to withstand the heavy wear and tear of mechanical towing over factory roadways, have larger than normal rubber-tyred wheels ranging from 6 in to 16 in dia. Both series have a 4-in offset dimension to facilitate swivelling.

Wheel types and choice of plain, needle-roller or taper-roller bearings are the same for both series, but the swivel constructions differ. The TRB series has a precision engineered taper-roller-bearing swivel which is adjustable, renewable and fully enclosed to retain lubricant. The LT series has a large 6-in P.C.D. ball-bearing swivel machined from solid steel mild steel blocks and using ¾-in dia steel balls that eliminate the king pin. The overall height is only 2 in more than the wheel diameter.

The new series of heavy-duty sprung castors are specifically designed for fairly high-speed towing over factory roadways, and are already standardized by service ministries for transportation of guided missiles.

The design allows for spring sizes to be adjusted to suit individual applications. Determining factors are load carried, floor or road conditions and speed, these affecting the overall height and amount of offset. The swivel bearing is in a fully-enclosed oil bath with adequate greasing facilities. Means for locking the swivel movement is provided so that the two rear castors of a trailer can be transformed into non-swivelling brackets to ensure accurate tracking when towed at high speed.

New 6-in and 8-in types are added to the Revvo range of pressed steel castors hitherto limited to 5-in dia wheels due to technical difficulties in drawing a castor fork of Revvo design to accommodate the larger wheels. As with other Revvo castors, the swivelling parts are held together by a large-diameter ball race. The four-bolt top plate is attached to the swivel cup by five rivets, and the assembly is designed to distribute all direct and shock loads over the full circle of the ball race. The fork pressing is deep drawn into a true tubular shape which keeps the forks vertical over their full length and eliminates the partially collapsed formation hitherto characteristic of pressed steel castor forks. A Neoprene seal retains the swivel lubricant.

NEW HYDRAULIC ELEVATOR TRUCKS

The 500-lb and 800-lb range of 'Vertolifter' hydraulic lifting trucks has recently been extended by Powell & Co., Burry Port, Carms, South Wales, with the introduction of new 1,200-lb and 1,600-lb models. These are available with two heights of lift, 60 in or 75 in. They can be fitted with either fixed or laterally adjustable forks, and detachable platforms can be supplied. The hand-pump models have a 2-speed hydraulic pump suitable for use at maximum load; alternatively a light load can be lifted more quickly. The battery electric model is supplied with a 12-V heavy-duty traction-type battery, and the mains electric models can have either 3-phase or single-phase motors of standard voltage ranges.

Heavy-gauge steel channel construction is used, and all models are issued with a test certificate when dispatched. All moving parts have ball or roller bearings. These machines are suitable for lifting goods, jigs, dies, press tools and stillages, for stacking, loading and unloading vehicles, and for general stores use.

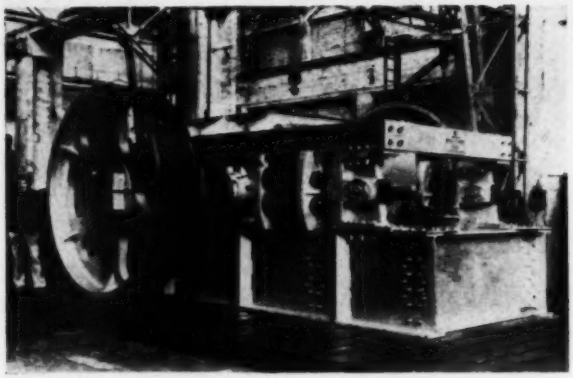
An example of the latest Vertolifter hydraulic elevator trucks of 1,200 lb and 1,600 lb capacities

BABBITLESS CRUSHING EQUIPMENT

Two types of crusher, which have been used over a period of many years at mining and quarrying properties overseas, are now manufactured in this country by Babbitless Co. (Great Britain), Ltd., 123 Victoria Street, London, S.W.1. Neither has bearings of babbit or anti-friction metal, but relies on roller bearings throughout.

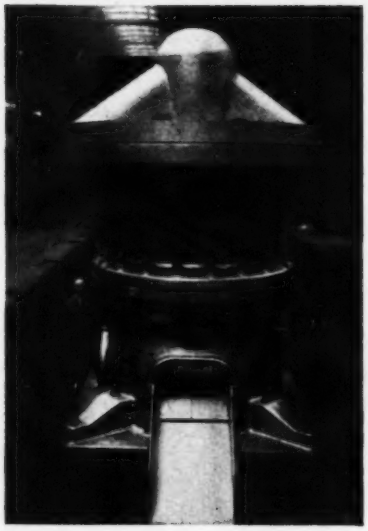
Suitable for dealing with tough and dry rocks and ores, even when very abrasive, gyratory-type electrically operated crushers are manufactured in a wide variety of sizes. Primary types range in fineness obtained from ¾ in to 10 in and in capacity from 6-9 to 3,300-5,500 tons/hr and secondary types from $\frac{7}{16}$ in to 2 in fineness and 3-4 to 280-330 tons/hr capacity. The four smallest sizes of the two types are inter-convertible. The mechanism consumes little lubricant, needing only small additions of grease every three months. To high rotational speeds and small degree of eccentricity are attributed high capacity and a more satisfactory cubical product. No lubricant cooling system is needed, thus simplifying installation and saving considerable power costs. Said to be dust- and water-proof, the mechanism has been designed to withstand arduous operating conditions,

(*continued on page* 303)



A Babbitless double slugger roll crusher of 1,000 tons/hr capacity

Fully castoring wheels are a feature of the new Lister Multi-Level power loader



Example of primary Babbitless gyratory crushers

while a more constant degree of fineness than given by conventional machines is obtained.

Recommended for handling wet and sticky materials, a range of electric double slugger roll crushers is produced, varying in minimum capacities at 6 in setting from 320 to 3,000 tons/hr. These have manganese steel shells with standard and longer teeth, or sluggers. The latter nip and shear the larger lumps and force them down, while the former complete the crushing process, a double action combining impact and compression.

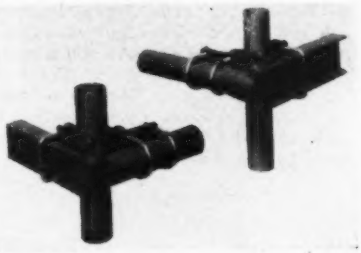
The rolls are individually driven at the same speed, and their bearings are mounted on very strong springs, giving an emergency opening for large pieces of tramp iron or uncrushable material. The rolls are easily adjusted and the machines are grease lubricated by a central system synchronized with the main drive. The manufacturers claim low power-consumption, high output and a lightweight shell. An important feature is that these crushers can be fed with run-in-mine ores without any scalping arrangement. This does not affect capacity and reduces the cost of the feeding arrangements. The teeth arrangement of the shells can be modified to suit them for secondary duties.

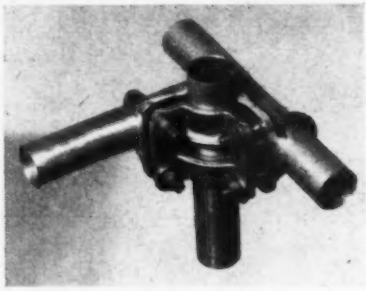
FOR ASSEMBLING TUBULAR STRUCTURES

A wide variety of tubular steel structures, including scaffolding, shelving, flooring, stairways and handrails, can be quickly and rigidly assembled with the new 'Fenco Gripklamp' fittings introduced by the Finspa Engineering Co., Ltd., Houghton Street, West Bromwich, Birmingham. Accurately dimensioned to fit B.S.S. 1387 steel tubes, they consist of shot-blasted malleable castings closed on to the tubes by electro-plated U-bolts, nuts and washers. They are available to suit four sizes of tubes of 1 in, 1¼ in, 1½ in and 2 in nominal bore, and can be obtained for assembling tubes of the same size or a combination of two sizes to form, for example, a 3-way tee, 4-way cross, 5-way cross star with side outlet or 5-way star with diagonal bracing.

Combination 'Gripklamps' are also available whereby standard rolled steel sections can be used for the main beams instead of tubes. These are of two sizes: type 31½, for 1½ in bore tube verticals and cross members, and type 32, for 2 in bore tube verticals and cross members and 3 × 1½ in channel or joist main beams. They provide the advantage of using a channel or joist section in place of a tube for the main longitudinal members of a structure, thus presenting a flat-top surface for easy attachment of a shelf platform or flooring. 'Gripklamps' can be supplied painted, galvanized or with other special finishes at extra cost.

Applications of Gripklamp fittings to (bottom) a 5-way tube assembly and to combinations of tubes and rolled steel sections





NEW POWER LOADER

The Lister range of power loaders has been extended still further by the introduction of a new version of the well-known Multi-Level model produced by R. A. Lister & Co., Ltd., Dursley, Gloucester. This has fully castoring wheels, to give greater manœuvrability in confined spaces, and in particular permits the machine to be moved sideways for making stacks side by side.

Loading heights are from ground level to 7 ft 6 in for delivery between 6 ft and 17 ft 6 in. All Lister static and mobile power loaders have a 2 in wide track, and three types of track are available to carry any load. Special side boards can be supplied and are easily fitted and removed as required, while a hopper and top sack platform are also available.

VACUUM PICK-UP DEVICE

A new invention by the Auto-Mac Engineering Co., 69 High Street, Rainham, Kent, is designed to speed up the production rate of machinery involving mechanical handling. This is a vacuum pick-up device that can be applied to accelerate picking up, lifting, transferring and lowering operations. It consists of a

An Auto-Mac vacuum pick-up device for handling electric light bulbs

telescopic tube with a vacuum pipe connection at its upper end and its lower end fitted with a pick-up head the design of which varies with the size and shape of the product to be handled. The operational length of the device can be governed by stop collars.

Picking up, lifting and releasing operations are achieved by movement of a small cam and vacuum valve. With the cam in the vacuum-on position, when the pick-up head makes contact with the product handled, the vacuum is sealed off, causing the telescopic tube to contract up to the stop collar and give the required lift. The vacuum is maintained while the article raised is transferred to its new position by an independent mechanical movement. It is then slowly released, allowing the tube to return to the extended length and deposit the article where required.

As these movements are almost instantaneous, the time saved can be used on the transfer movement, thus slowing it down and allowing an ultimate increase in the speed of the machine and the production rate. The time saved in handling electric light bulbs, for example, is said to be 50 per cent. Where a vacuum pick-up is not used a specially designed head can be incorporated to suit individual requirements.

TRADE NOTES

British Branch for Leroy Motors

Leroy Motors, of France, have opened a sales office at 68 Victoria Street, London S.W.1, under the management of L. Castay, for the distribution of electrical equipment manufactured in their works at Angoulême. This factory has been extended in recent years by the building of new workshops, the enlargement of the steelworks and the cast-iron and alloy foundry and the rebuilding of the machine tools depot.

Principal classes of Leroy's current electrical equipment are totally enclosed electric motors of 1/6 h.p. to 125 h.p. capacity; 2-300-h.p. drip-proof motors; the direct-ventilation 'N' motor, in capacities up to 160 h.p.; drip-proof and ventilated brake motors capable of making up to 3,000 starts/hr; and alternators of both the standard type and the self-regulating type introduced in 1957, which operates without external auxiliaries, brushes, slip-rings, or commutator.

Change of Address

Power Jacks, Ltd., announce that they are now operating again from Valetta Road, Acton, London, W.3, as an entirely self-contained organization. Manufacturing, engineering, accounts and sales departments will all be operating from this address.

Newton shock absorbers and clutch plates will be manufactured in the Valetta Road factory and sold from the same address. F. J. Fagard, A.M.I.Mech.E., has been appointed managing director.

Brimpex Move into Larger Premises

Industrial Machine & Equipment Co. (Brimpex), Ltd., are moving from their factory at 41 Murray Road, London, into large and more modern premises on the Yorktown Industrial Estate in Camberley, Surrey.

The move is necessitated by a constantly increasing demand for Brimpex products. It is stated that 88 'Brimpex' lifters are in use by one company. Another user reports that one machine is known to have raised the equivalent weight of several R.M.S. *Queen Mary's* during its continuous and trouble-free use over a period of some four years.

It is the company's intention to add further models to their already extensive range of patented hydraulic lifting machines, which includes the 'Brimpex' self-actuating lifter, a 5-ft, 7-ft, and telescopic models, and 'Brimpex' hydraulic stackers, barrel lifters, and interfloor lifts and lifters.

The company's head office will be at the new factory, the address being: Brimpex Works, Yorktown Industrial Estate, Camberley, Surrey. Telephone CAMberley 2688.

F. J. Fagard, A.M.I.Mech.E., managing director, Power Jacks, Ltd.

'Brimpex' hydraulic lifting machine on lorry-loading duty. 'Brimpex' equipment is now being manufactured in the new Camberley factory of Industrial Machine & Equipment Co. (Brimpex), Ltd.

Large Orders for Aircraft-towing Tractors

It is announced that during recent weeks, orders placed with David Brown Construction Equipment, Ltd., Feltham, Middlesex, for industrial wheeled tractors and equipment have amounted to a total value of approximately £125,000. These orders were for the supply of more than 100 tractors equipped for use at airfields, docks, and harbours, in many countries.

The largest single contract is from the Ministry of Supply for 55 diesel tractors to be used by research establishments and on experimental airfields, all except six of which are 'Turbo-Taskmaster' machines designed for ground handling of aircraft weighing up to 110,000 lb and for general airfield haulage duties.

Coincident with the supply of 'Comet 4' airliners, the de Havilland Aircraft Company of Hatfield, Herts, has placed an order for 12 David Brown 'Turbo Taskmaster Super' tractors on behalf of Areolineas Argentinas. These tractors are capable of handling aircraft weighing up to 157,000 lb. Another specially equipped 'Turbo Taskmaster Super' has been ordered by the Atomic Energy Authority to supplement a similar tractor already operating at Harwell, Berks.

Four David Brown 'Taskmaster' diesel tractors were recently delivered to the Argentinian Navy for use aboard the aircraft carrier *Independence*—previously H.M.S. *Warrior*.

A repeat order for 12 'Turbo Taskmaster' diesel tractors has been placed by the Royal Norwegian Air Force, and two have been ordered by the Royal Rhodesian Air Force. On order from the Pakistan Air Force are 27 'Turbo Taskmaster' petrol tractors. Eight more, some with petrol engines, have been ordered by the Douglas Aircraft Corporation.

Among repeat orders recently received by David Brown is one from the Nigerian Ports Authority, through the Crown Agents, for seven 'Turbo Taskmasters' and two 'Turbo Shunter' tractors. They are destined for the new port development project in Apapa, near Lagos, and for Port Harcourt.

(*continued on page* 305)

Main machine shop of Aircraft Steel Structures, Ltd.

25-ton Coles crane fitted with radio-telephone equipment

Simms Acquire Aircraft Steel Structures

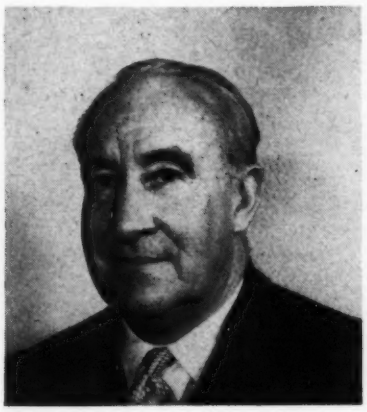
The Simms Motor & Electronics Corporation, Ltd., have acquired the whole of the issued share capital of Aircraft Steel Structures, Ltd., Western Avenue, Middlesex, of which they have held one-third since 1956.

Aircraft Steel Structures, Ltd., was founded in 1944 and moved late in 1957 to their present premises, which are equipped to undertake high precision engineering work in all fields. The company claims special skill in work connected with hydraulics and vacuum pumps. The plant in the new factory is valued at £250,000 and includes many machines devised and developed by Aircraft Steel Structures, Ltd., themselves. These enable the company to undertake a wide range of precision work to exacting specifications.

Electro-Hydraulics Sales

Electro-Hydraulics, Ltd., recently announced the establishment of a new Industrial Hydraulic Sales Department under the direction of Mr. L. Rumley (sales director of Electro-Hydraulics, Ltd., and Conveyancer Fork Trucks, Ltd.).

L. Rumley, who will direct the newly formed Industrial Hydraulic Sales Department of Electro-Hydraulics, Ltd.



Electro-Hydraulics, Ltd., have been long established as manufacturers of fork lift trucks and hydraulic equipment for aircraft. The formation of the new department signifies a development of sales in the industrial field. The company are offering a wide range of solenoid valves and hydraulic cylinders and will undertake design, development and manufacture of hydraulic, electro-hydraulic and servo systems for numerous industrial applications. Electro-Hydraulics equipment is used in collieries, machine-tools, chemical plant, shipping, railways, mechanical handling plant and machines, the oil industry, nuclear and other power-stations, and many other applications where the characteristics of hydraulic power transmission and control offer advantages over alternative methods.

Radio-Controlled Crane Fleet

G. W. Sparrow & Sons, Ltd., of Bath, have equipped their hire fleet of Coles cranes with radio-telephone sets capable of operating within a 50-mile radius of the depot. They are used to improve service to the customer by enabling crane operators to call their base for equipment or advice without leaving the vehicle.

In addition to this more obvious application of the radio-telephone equipment, Sparrows have had the sets adapted for use when working with very long jibs. Although operators and slingers are well trained in the correct use of hand-signals, it becomes increasingly difficult for the crane operator to see the signals when jibs of 70 ft to 140 ft are in use. Though the use of the radio-telephone link between cranes and depot is limited to the 50-mile radius, the adapted sets can be used when working with very long jibs on contracts throughout the country.

Whitlock Factory Extension

Plans have been passed for the erection of factory extensions covering 50,000 sq. ft. together with an additional access road, for Whitlock Bros., Ltd., on their 30-acre site at Yeldham.

Coal Board Contract for Humphreys & Glasgow

The contract for supply, delivery and erection of a skip-winding plant at Lady Windsor Colliery, in the Rhondda Valley, has been awarded by the National Coal Board to Humphreys & Glasgow, Ltd., of London. It is part of a major re-organization at this colliery, and the installation has to be programmed to ensure as little interference as possible with normal working and to fit in with all the other work concerned.

The new plant will be able to wind at a rate of 240 tons/hr, from a depth of 687 yd. As the winding cycle totals 90 sec, this rate allows a decking time of only 15 sec. The upper portion of each skip will be fitted with a hinged deck and safety gate, and is designed to carry 15 men, or alternatively a single mine-car with a gross weight of 4 tons.

Particular attention has been paid to the problem of spillage and disintegration of coal. The entire plant will be automatic in operation, with manual over-ride control where necessary, and is so designed that it will automatically fail to safety.

Designed by Dunlop for use on heavy earth-moving machines, this 33·5-in × 33-in 22-ply tyre is one of the largest ever made in Great Britain. Weighing 2,000 lb, it is of 88·4 in outside diameter and 33·5 in wide, and contains 340 miles of nylon

James Burrough's New Distillery

Good progress is being made in the conversion and re-equipment of an existing building in Montford Place, Kennington, for use as a distillery by James Burrough, Ltd., Hutton Road, Lambeth, London, S.E.11. Triangular in plan, with a total floor area of 82,000 sq. ft., the structure is now admirably adapted to its new function, but the work presented some unusual problems.

When a tour of the building was made recently by technical press representatives, one of the five large rectifying stills, 33 ft. tall, was already in operation, and the other four, together with two smaller rectifying stills, pot stills, and condensers, were shortly due to be in commission. Some of the blending and storage tanks had been installed, and the shape of the scheme for bottling and filling could be seen.

An extensive conveyor system for the handling of cases was virtually complete, and a bottle washer, filler, and labelling machines had been installed. Bottles will be washed and dried at the rate of 300 dozen an hour, and a fully automatic bottling and labelling line will operate at the same speed. In addition, the initial project provides for two semi-automatic lines and envisages a total throughput of 360 dozen bottles an hour. This represents a total output of 10,000 gallons of gin a day, 90 per cent. of which will be exported.

When the project is near completion, details of the interesting handling arrangements will be described in a future issue of this journal.

Parker's New Canadian Company

Frederick Parker, Ltd., of Leicester, announce the formation of Frederick Parker (Canada), Ltd., to look after their Canadian interests. The company's headquarters will be a new block of offices forming part of the Parker Canadian depot now being built in the Scarborough district of Toronto.

The contract for the depot was signed by F. W. Parker, joint managing director of Frederick Parker, Ltd., during his 15,000-mile tour of Canada shortly before Christmas of last year. Mr. T. C. Greenhough, Canadian manager for Parkers, will be manager of the Canadian company.

The building, which is being erected on a 4½-acre site but initially will cover an area of 7,000 sq. ft., will be used mainly as a warehouse for spares, but will also be equipped to deal with heavy machinery.

At the company's Christmas meeting, F. W. Parker told employees: 'Our American competitors are boasting a 24-hr spares delivery service in Canada. We must be in a position to give deliveries like this. The importance of service cannot be over-estimated.'

German Manufacturers of Lifting Equipment Invite British Licences

Eisenwerk Friedrich Schroder, of Munich, manufacturers of hoists and lifting platforms, inform us that they welcome the opportunity of manufacturing and distributing British products under licence in the Bundesrepublik region of Germany. Their address is Gneisenaustrasse 35, Munich 54.

Ore-handling Contract

Moxey, Ltd., of Birmingham, have been awarded a contract by the South Durham Steel & Iron Co., Ltd., for the manufacture and installation of ore-handling and grading plant at their West Hartlepool South works.

This plant will handle graded and ungraded ore at the rate of 700 tons/hr from railway wagon tippler to a distribution house, whence the ore may be conveyed to the screen house, to the 1,000-ft long stockyard, by boomstacker, or direct to blast-furnace bunkers. Also handled by this plant will be limestone, coke and sinter.

Oil-well Drilling in Southern Iraq

In August of this year, Keir & Cawder Arrow Drilling (U.K.), Ltd., of Bishopbriggs, Glasgow, will begin drilling operations for Basrah Petroleum Co. on the Rumaila oil field in Southern Iraq. Heavy equipment, including two drilling rigs capable of drilling to depths of 12,000 ft, is now being assembled in the United Kingdom.

For transport across the desert between locations, the complete rigs will be mounted on tracks drawn by Caterpillar tractors. These tractors, which will be shipped from the United Kingdom, will be the first to come off the assembly line of the recently opened Caterpillar factory at Tannochside near Glasgow.

Development of the Rumaila and Zubair fields is expected to expand the oil capacity of Southern Iraq from 12,000,000 tons to 22,000,000 tons a year. Development will run concurrently with the works programme and the construction of a deep-water terminal at the mouth of the Shatt al Arab, which will cost £25,000,000.

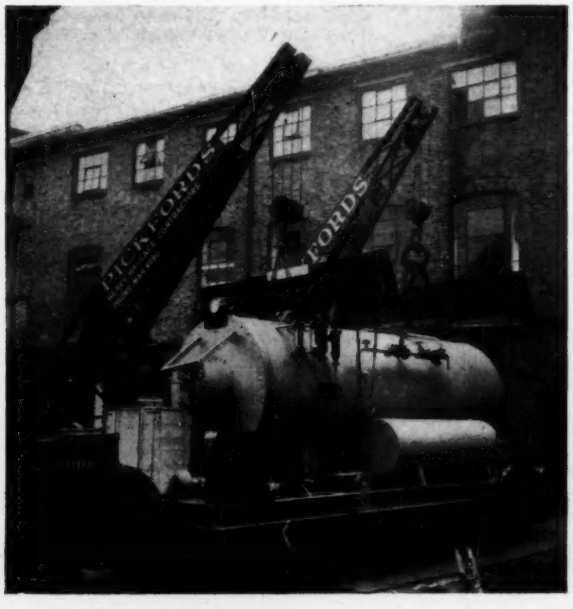
Conveyor Terminology

The Fédération Européenne de la Manutention announce the publication of the first edition of their 'Illustrated Terminology of Mechanical Handling Appliances'. The dictionary contains 64 pages, on which the equipment is illustrated and defined in English, French, German, Italian, Spanish and Swedish. There is also a general alphabetical index.

Copies are available from Compagnie

BELOW

Two 10-ton diesel-electric Ransome & Rapier mobile cranes, modified by the manufacturers to Pickfords' requirements, operating in tandem to offload the Babcock & Willcox 'Steambloc' boiler for James Burrough's new distillery



Equipped with a 24-in bucket, this Blackwood Hodge 'Gradall' excavator is digging a trench through approximately 10 in of reinforced concrete in what will eventually be the centre reservation between the dual-carriageways of Hendon Way. The old 7-in asphalt surface had been removed by the 'Gradall' equipped with a 47-in pavement removal bucket

Francaise D'Editions, 40 rue du Colisée, Paris 8°.

Fédération Européenne de la Manutention Section II

Section II (Continuous Conveying Equipment) of the Fédération Européenne de la Manutention held meetings in Nice on March 18th, 19th and 20th, 1959, and there were present delegates from Austria, Belgium, France, Germany, Great Britain, Italy, Saar, Sweden and Switzerland. The meeting of the Section was presided over by Mr. F. S. Stent (Great Britain).

It reports considerable progress in the preparation of the second edition of the Illustrated Terminology, which will feature the principal component parts of continuous conveying apparatus and will be presented in loose-leaf form. The section is also engaged in the production of a European classification of materials, and is negotiating with the Fédération Internationale de Documentation on the subject of universal decimal classification.

Study is being made of the possibility of creating European standards for various aspects of conveying plant and common ground has been achieved in respect of belt widths and edge clearances of belts. Considerable importance is attached to the need for interchangeability of complete idler sets and the section has been largely successful in its efforts to find a formula acceptable to the European countries involved. It is also examining the possibilities of standardizing certain components of gravity roller conveyors.

The next meetings of the section will be held in Lucerne on September 21st, 22nd and 23rd, 1959.

Martonair Manchester Office

Martonair, Ltd., manufacturers of pneumatic equipment, announce the opening of a Manchester office on April 13th. The office, at 66 Mosley Street, Manchester 2 (CENtral 0032), will be managed by Eric Donlon, and will carry stocks of cylinders, control valves, and accessories.

This 'Atlas' 400-ton diesel-electric floating crane manufactured by Verschure, of Amsterdam, is shown on the first stage of a 4,700-mile journey to the Lake Maracaibo oilfields, where it will be used by Compania Shell de Venezuela. Each of the two jibs is equipped with two sets of 120-ton lifting tackle, which can be operated independently in any combination. Four tackles, each adjusted to a load of 24 tons, will control the sideways movement of the load. With the 'Atlas', it will be possible to move an entire block station in two lifts and to transport a complete drilling floor and derrick from one foundation to another

International Harvester to Sell British Tractors in U.S.A.

At the annual stockholders' meeting of International Harvester Company in Chicago, President Frank Jenks announced that the company will be importing farm tractors into the United States this year, and that these will be British-built B-275 diesel tractors from the IH works at Bradford.

Commenting on this news, Omer G. Voss, managing director of the British company, remarked that ten years ago they had not yet built the first International tractor in England, yet already a variety of wheeled and crawler tractors ranging in capacity from 30 b.h.p. to 124 b.h.p. were produced in the Doncaster and Bradford works.

Pointing out that the B-275 tractor would be sold alongside the comprehensive range of machines provided by U.S. factories, he said that it had won its place in the American market because of its economical 35-h.p. diesel engine and many acceptable features.

Canada has ordered approximately 2,600 Bedford tractors for early shipment this year, and the total orders held at present exceed those of last year by a considerable margin. The Bradford works is operating at full capacity to clear the backlog of orders from 53 countries.

JUNE

The above issue will contain the following:

Side Loaders in a Timber Mill

'Non-fixed' Conveyors and Elevators—Part 17

Survey of Exhibitions at Home and Abroad

Cooling Pitch on Conveyors

and usual features

PUBLICATIONS RECEIVED

Rapid Magnet Machines, Ltd.
Publication No. 30 covering 'Rapid' deep field suspension magnets for extracting tramp iron has been issued from Lombard Street, Birmingham, 12.

Crofts (Engineers), Ltd.
A brochure describing small power worm reduction gears and a further leaflet describing 'Ritespeed' motorized conveyor pulleys have been received from the Crofts offices at Thornbury, Bradford 3.

Aveling-Barford News
No. 9 of the above publication describing the company's activities in various parts of the world is now available from Invicta Works, Grantham, Lincs.

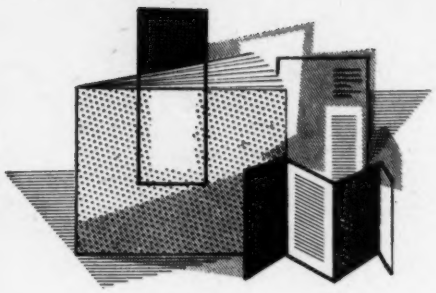
Marshall Organisation
The House magazine of Marshall's of Gainsborough, Spring number, has recently been issued from Stafford House, Norfolk Street, London, W.C.2.

Crompton Parkinson, Ltd.
Crompton Parkinson are issuing from Crompton House, Aldwych, London, W.C.2, a brochure describing the company's fractional motors repair and renovation service.

Moxey, Ltd.
From 13 Augustus Road, Birmingham, 15, Moxey have sent us their general catalogue describing a wide variety of handling equipment ranging from ore plants, bulk handling, belt conveyors, bucket elevators, skip hoists.

Chamberlain Industries, Ltd.
A comprehensive booklet dealing with press bending has been received from Staffa Works, Staffa Road, London, E.10.

Lancashire Dynamo & Crypto, Ltd.
A brochure dealing with electro-mechanical brakes, A.C. and D.C. types, has been sent to us from the Lancashire Dynamo Works at Trafford Park, Manchester.



ABSTRACTS AND REFERENCES

Articles on mechanical handling published in all technical and industrial journals of the world are indexed and abstracted below. Whenever it is known, the published price of the journal containing the article is given.

The addresses of the publications concerned are given and applications for copies of the journals mentioned should be made direct.

CRANES FOR CARGO CONTAINERS

Cargo Container Ships. By Doros A. Argyriadis. Paper presented to The Institution of Naval Architects, 10 Upper Belgrave Street, London, S.W.1.

The advantages of container ships in comparison with conventional dry-cargo ships are discussed in some detail. It is argued that the container ship is a specialized type that must be designed around a specific number of containers, and the design of the containers themselves and the methods available for loading and unloading them are therefore considered also.

Gantry-type travelling cranes, erected either on the ship or on shore, are presented as the most efficient media for this purpose. A large section of the paper is devoted to the design of cranes in this category, and to the operational procedures associated with them. Their preferred capacity range, speeds and dimensional requirements are stated specifically, and some of the types available are illustrated by drawings. The possibilities of automatic control are reviewed and assessed in relation to first cost and to the complications arising during the shore loading and unloading cycles.

In relation to the design of the container ship, it is argued that the hatches should be almost as big as the holds and that the containers should be stowed on top of each other in cells formed by guide-angles installed in the ship and set out to close tolerances.

CARGO CONTAINERS AND CONTAINER SHIPS

Best Ship Design for Particular Route. By Doros A. Argyriadis. Journal of Commerce & Shipping Telegraph, 17 James Street, Liverpool. April 2nd, 1959. P. 8. 4d.

In considering the economic aspects of ship design the author lays stress on the importance of formulating the optimum size of container and deals at some length with the problems raised.

They are made difficult and complex by the premise that different trade routes have different container requirements. The economic desirability of designing the ship to suit the container has now been recognized, but the naval architect's task is complicated by the difficulty of reconciling three conflicting requirements.

The first is that for each specific route there is an optimum size of container and there is no basis for assuming that the various optima can be correlated. Secondly, there is no guarantee that a ship will always remain in service on the route for which it was designed. And, thirdly, the other requirements involved in the handling and transportation of the goods forming the cargo should be related, and, if possible, reconciled, with those obtaining on board the ship.

Having reviewed these broader aspects, the author goes on to discuss the details of ship design in relation to methods of stowing various classes of cargo, the optimum ration of fixed ballast to cargo deadweight, and the structural problems associated with container ships.

MANUFACTURE OF PREFABRICATED HOUSE UNITS

Visite a l'Usine S.E.R.P.E.C. de Montesson. *Manutention*, 40 Rue du Colisée, Paris 8. March, 1959. Pp. 66-70. 500 fr (in France), 600 fr (countries outside France).

Handling methods employed by a company manufacturing large prefabricated house units are described in an article that covers the entire sequence, from the unloading of bulk raw materials arriving by barge to the stocking-out and final dispatch of the finished units and their erection on the site.

OUTLOOK FOR MECHANICAL HANDLING INDUSTRY IN U.S.A.

Survey Report, 1959—Conveyors, Cranes and Industrial Hoists; Industrial Trucks. *The Iron Age*, Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A. January 1st, 1959. Pp. 164-165, 192-193. 50c.

In the *Iron Age* surveys of industrial trends, the prospects for American manufacturers of conveyors, cranes, hoists and industrial trucks are among the brightest in the list.

The surveys present an analysis of the estimates obtained from manufacturers of the current trends of their wage costs, volume of sales, selling prices and profits, and the replies given by executives to the question 'What technical development or marketing problem do you feel will have the most important effect on your industry during 1959?'

CHAIN WEAR IN MINES

Metallurgical Treatment of Colliery Mechanical Equipment. *Iron & Coal Trades Review*, John Adam House, 17-19 John Adam Street, Adelphi, London, W.C.2. March, 27th 1959. Pp. 731-732. 1s.

Extracts taken from the annual report of the Safety in Mines Research Establishment contain interesting evidence on the characteristics of chain wear obtained from the results of laboratory experiments.

The development of wear in relation to strength is associated with the comparative rates of wear in different categories of material, the effect of wear on the strength of links, and the strain-ageing embrittlement of cage-suspension and haulage gear. It is pointed out that the periodic heat-treatment of wrought-iron and mild-steel cage-haulage gear, which is called for by statute, can, if incorrectly applied, lead to the heat-embrittlement of wrought iron and of some of the mild steels.

CONVEYOR-CONTROL TECHNIQUES

Conveyor Control Systems. By Thomas P. Thomson, *Electrical Review*, Dorset House, Stamford Street, London, S.E.1. April 3rd, 1959. Pp. 629-632. 1s. 6d.

After discussing the three basic methods of sequence-starting—power, pilot and centrifugal switch—the author describes some complex systems and shows how they can be broken down into basic circuits. He also considers the problem of safety and the presentation of information by means of mimic diagrams.

CARGO-HANDLING EVOLUTION

Fifty Years of Port Operation. *The P.L.A. Monthly*, Trinity Square, London, E.C.3. April 1959. Pp. 101-104. 1s.

In an issue commemorating the 50th birthday of the Port of London Authority, the evolution of inter-port craft and cargo-handling methods are traced in broad outline.

Among the more striking developments that have taken place during the half-century are the growth of our export trade and the carefully planned mechanization of certain berths. These changes are typified by the giant units, such as locomotives and refinery equipment, that are now loaded on to ships, and the palletization of cargo now handled by fork lift trucks and cranes at a speed that has reduced by 20 per cent the turnround time of the vessels in the port.

AUTOMATIC GAUGING FOR UNIT ASSEMBLY

Electronic Gauges Sort Small Parts for Better Fits. *The Iron Age*, Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A. March 12th, 1959. Pp. 124-125. 50c.

Aetna Ball & Roller Bearing Co. are shown to have increased their production output by 400 per cent since installing electronically controlled gauging and sorting equipment in their roller bearing department. The gauging equipment is used in conjunction with conveyors, chutes and storage bins to effect the

(*continued on page* 309)

automatic segregation of rollers and races into size categories within the limits permissible for precision assembly.

ADVANCED HANDLING THROUGH MACHINE SHOPS
Production of Components for Automatic Transmissions for Motor Cars. *Machinery*, Clifton House, 83-117 Euston Road, London, N.W.1. April 1st, 1959. Pp. 714-722. 1s. 3d.

In the Ford Motor Co. factory at Sharonville, U.S.A., an advanced degree of automation has been attained in the handling and storage of work in progress as well as in the actual production processes and machine-tool transfer lines.

The factory is devoted to the production of components for Ford automatic transmissions, from the blanks, forgings and castings to the finished pinions, valve bodies, ball-races and converter assemblies. Zig-zag storage units are used to adjust the flow of oncoming parts to the feed requirements of the machines. The work flows continuously in a system of conveyors, chutes and elevators, and is fed, discharged and routed automatically to and from the machines.

HANDLING EQUIPMENT FOR THE FARM
Villiers Diamond Jubilee Exhibition. *Villiers Magazine*, Marston Road, Wolverhampton. 1959, No. 18. Pp. 2-17.

At an exhibition held in London to mark the diamond jubilee, handling machinery for use on the farm bulked largely among the exhibits by motor car, motor cycle and other manufacturers using Villiers and JAP engines. Tractors, elevators, potato sorters, hoists, cranes, winches, industrial trucks, and a variety of special-purpose lifting and manipulating machines, are illustrated in the jubilee number of the Villiers house journal.

AUTOMATION IN SHELLMOULDING
Mechanized Shellmoulding in an American Foundry. *Foundry Trade Journal*, John Adam House, 17-19 John Adam Street, Adelphi, London, W.C.2. March 26th, 1959. Pp. 352-356. 1s.

A description is given of the Evinrude Motors shellmoulding foundry at Milwaukee, Wisconsin. The plant produces steel crankshafts for outboard motors and is fully automatic, only 20 men being employed. A detailed account is given of the production cycle and movement of materials, from the discharge of sand from gondolas on the rail siding to the ejection of the completed shell from the closing machine.

AIR-BAG DISCHARGE FOR BUNKERS
Rubber Air Bags for Bunkers. *Rubber Developments*, Market Buildings, Mark Lane, London, E.C.3. Spring, 1959. Pp. 7-8.

Bunkers containing coal or chemicals, or other clogging materials, can be emptied quickly under remote control by means of a system employing air-filled rubber bags that has been developed by a German firm. The principle of operation, specification details and method of installation are stated in the article.

PASSENGER CONVEYORS
Some Developments in Rubber Conveyor Belting. Part I—Passenger Conveyors. *Rubber Developments*, Market Buildings, Mark Lane, London, E.C.3. Spring, 1959. Pp. 34-36.

Potentialities of the rubber-belt conveyor, or moving sidewalk, for transporting pedestrians along the streets and inside large buildings are reviewed in this article. A brief account is given of the passenger conveyor installed at Dallas Airport, Texas.

RECENT PATENTS

The following are brief extracts of recent United Kingdom patents which we believe will interest our readers. For full details the original patent specifications should be consulted at, or bought (3s. 6d. each) from, The Patents Office, Southampton Buildings, Chancery Lane, London, W.C.2.

BOAT HOIST
Maatschappij Van Davitoctrooien Co., N.V., of Utrecht—U.K.731717.

Patent, amended, for small emergency hoist with a portable motor and winch for lowering to sea, using an attachment to ensure location of the square shaft drive.

CABLE LAYER
Her Majesty's Postmaster General—U.K.806123.

Cable-laying ship for paying out telephone cable with repeaters has a slitted sheave drum to accept the rigid portion without strain.

CONCRETE BLOCK HANDLING
J. Orsinin, of Milan—U.K.806125.

A pallet design for moving blocks of concrete by swing fork.

CRATES
Dairy Supply Co., Ltd., of Park Royal—U.K. 806147

Polygonal wire crates which stack on each other, with projections at the case resting in rim depressions.

STACKER
B. R. & N. Guigni, of Ravenna—U.K.806158.

A combined lift-ladder based on a frame leaning against a stack, with a cable to pull up the load.

EARTHMOVER ATTACHMENT
H. A. Forte of Los Angeles—U.K.806275

Digging and cleaning attachment for dozing duties, having pivoted teeth, sets on the mouldboard of a bulldozer.

PALLET SUPPORT
W. C. Youngman Ltd., of Crawley, in U.K.806314.

A design with stacking legs and corners to transmit load, using tubular frame members which can be dismantled.

TUB PUSHER
H. P. Vorthmann, of Mulheim—U.K.806326.

A pusher for moving mining tubs on to cages from a track. Breakage is avoided by using telescopic tubes with spring shock absorbers.

LOADER
P. Dunne, of Eire—U.K.806328

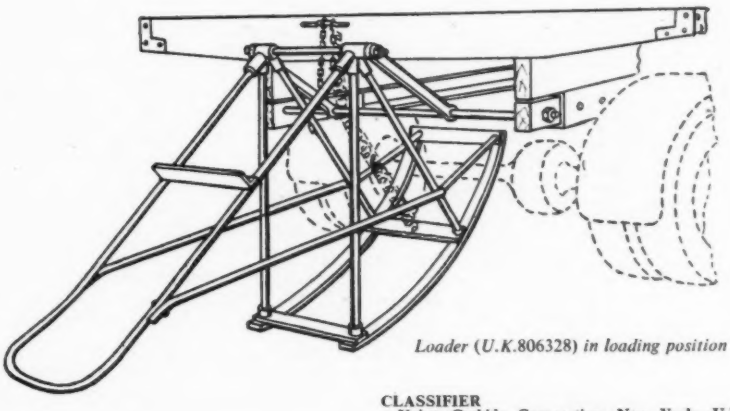
Soft goods lorry-loader rear attachment for handling casks, barrels, drums, etc., using a rocking member with an extensible platform.

SMALL TRANSPORTER
Aktiebolaget Svenska Flaktfabrik, of Stockholm—U.K.806332

An endless band transporter for small items, working intermittently but accurately. Stopping and starting is effected pneumatically by raising and lowering the belt.

EARTH MOVER
Idaho Manufacturing Co., of Boise, U.S.A.—U.K.806380.

Dumper-digger-spreader device with claw loading using an easy scraper design of low power requirements and having a reciprocating lever to work the apron filler. Four-wheel drive.



Loader (U.K.806328) in loading position

CLASSIFIER
Union Carbide Corporation, New York—U.K. 806418.

Machine for separating caseless from skinned frankfurters after processing, by sensing their coefficient of friction, skinless ones not sliding far.

VIBRATOR
Rownson, Drew & Clydesdale, Ltd., of London—U.K.806441.

Use of hydraulic coupling to reduce motive power needed to overcome initial friction when driving vibrating sieves or troughs.

LIFT SLING
H. Meisen, of Augsburg—U.K.806461.

Crane wire-cable with an eye construction to protect loop ends against lug damage.

CONVEYOR CHAIN
New Conveyor Co., Ltd., of Smethwick—U.K. 806463.

A traverse guide channel beneath the floor reduces wear by guiding each link horizontally and vertically, thus avoiding bowing or bulging.

ELEVATOR RAILS
Otis Elevator Co., of New York—U.K.806465.

U.S. patent 2700434 which is concerned with ways of avoiding troubles encountered when tall shafts are installed in buildings. An elevator guide rail mount allows vertical movement between rail and fastener without deformation and permits horizontal adjustment.

CAR PARK
R. S. Pearce, of Windrush—U.K.806573.

A garage for town cars with lift and transporter design to serve many floors.

CONVEYOR ROLLERS
Fred Kidd, Ltd., of Stockton—U.K.806605.

Undue flexing and fatigue of roller shaft avoided by use of resilient bowed bar or tube in improved support bearing.

WORKBENCH TROLLEY
Croftshaw Engineers, Ltd., of Cheshunt—

A two-wheeled trolley with folding work-table for use alongside oxy-gas welding cylinders.

CAR PARK TOWER
P. J. Scott, of Jacson, Mississipi—U.K.807613.

Vertical garage with conveyorized chains and cages carrying cars between large sprocket wheels.

SKIP CHARGER
Skip Campagnie G.m.b.H., of Essen—U.K. 806718.

Two charging bins are fed from mine tubs to fill skips of different capacity, with inlet and outlet bin control. A common tipper is used with a gate operating device on the bins controlling load distribution.

FOWL PLUCKER
H. F. Engineering Co., Ltd., and B. Lewis & Co., Ltd., of London—U.K.806740.

A fowl-plucking device with drums rotating at 500 to 800 r.p.m., with fingers in staggered rows removing all feathers.

CRANE TRACK
Allmanna Svenska Elektriska Aktiebolag, of Sweden—U.PK.806770.

A governor-controlled wheel speed is used with undue side movement prevention to avoid rail wear or rail jump due to misalignment of crane bridge track.

PLATING CONVEYOR
Udylite Research Corporation, of Detroit—U.K. 806822.

A workpiece conveyor for moving along straight paths with curved turnround, somewhat as per patent 715084, but with greater spacing to turn larger pieces than previously.

BIN TIPPER
K. H. Schmidt, of Nurnberg—U.K.806859.

A dust cart bin tipper for large industrial containers as used with shavings and swarf, having bifurcated lifting arms on either side.

MULTI-STOREY GARAGE
M. Alimanestiano, of New York—U.K.806866.

Wheeled chassis transfer device for moving cars, etc., up or along many levels in a garage.

ASSOCIATED ILIFFE TECHNICAL BOOKS

Books Recommended by

'MECHANICAL HANDLING'

ABACS OR NOMOGRAMS

A. Giet, Translated and revised by J. W. Head, M.A.(Cantab.), and H. D. Phippen, M.A.(Edin.), B.Sc. (Lond.). 35s. By post 36s.

CONSTRUCTIONAL STEELWORK SHOP PRACTICE

John Farrell. 15s. By post 16s. 1d.

ELECTRONIC COMPUTERS: Principles and Applications

Edited by T. E. Ivall. 25s. By post 26s.

MATERIAL HANDLING IN WORKS STORES. Second Edition. The Fork-Lift Truck and Pallet System

L. J. Hoefkens. 18s. By post 19s.

PRINCIPLES OF MASS AND FLOW PRODUCTION

Frank G. Woollard, M.B.E., M.I. Mech.E., M.I.Prod.E., M.S.A.E. 25s. By post 26s. 4d.

PRODUCTION ENGINEERING: Practical Methods of Production Planning and Control

J. S. Murphy, A.I.I.A. 12s. 6d. By post 13s. 5d.

Obtainable from all booksellers or direct from

THE PUBLISHING DEPT.
DORSET HOUSE
STAMFORD ST., LONDON, S.E.1

LIFT TRUCK
Clark Equipment Co., of Michigan—U.K.806963.

A design of masted telescopic lift truck which gives lateral slide of load from a stack being then able to swing if required without remounting on load carrier—for use in narrow warehouse gangways.

DENSIMETRIC SEPARATOR
E. Dombly, of Fontainbleau—U.K.806973.

A coal or ore separator using float-and-sink methods, with separate light and heavy discharge as well as recycling, using a rotatable baffled drum with top chutes.

CARGO STORAGE
Kwikform, Ltd., Birmingham—U.K.807032.

Handling of unboxed cars, etc., in ships' holds aided by use of gantries supporting, say, three tiers above hold deck, via temporary floors each with its own braced gantry.

LIFT TRUCK
Yale & Towne Manufacturing Co., New York—U.K.807040.

Ram guide for industrial truck to ensure all pressures in hydraulic ram piston are axial whatever the secondary upright position.

LIFT CONTROL
J. & E. Hall, Ltd., London—U.K.807046.

Multi-floor system with several lifts under electrical supervisory circuits for answering calls expeditiously.

TRANSFER APPARATUS
Ipsen Industries Inc., Illinois—U.K.807060.

Endless conveyor with abutments to perform successive actions on parts transferred on belt.

SELF-CENTRING ROLLERS
United States Steel Corporation, Pittsburgh—U.K.807061.

Improved tracking for conveyor belts whether or not loaded, is provided by narrow-bodied rolls at ends to give curved carrying surfaces.

EXTENSIBLE CONVEYOR
Joy Manufacturing Co., Pittsburgh—U.K.807068

Mobile conveyor for coal mines to reduce number of major extensions of system, using a belt-storing section carried internally on a carriage.

CONVEYORIZED OVEN
Gustin Bacon Manufacturing Co. Inc., of Kansas City—U.K.807073.

Automatic handling machine for resin-impregnated fibres on mandrels, somewhat as per patent 804436, with a high rate of cure.

TIPPER
Edward Brothers Tippers, Ltd., of Bolton—U.K.807104.

Underswung tail gate with improved latching design. A pivoted lever underneath opens the gate on tipping, and catches it on return.

CHARGING HOPPER
Gebr. Eickhoff Maschinenfabrik u Eisengiesserei m.b.H., of Bochum—U.K.801164.

Charger for chain-link steel plate conveyors supported by pairs of rollers carried on guide rail tracks, with support modified at hoppers to prevent excess strain and wear by use of slide rails.

LABEL APPLICATOR
Dennison Manufacturing Co., of Massachusetts—807184.

A label transfer machine for movement from a carrier to transparent film, e.g. as in heat transfer processes, the machine being synchronized with other machines.

HOIST CLAW
K. H. E. Thomsen, of Denmark—U.K.807366.

Gives a good grip, even with an oblique pull and can be locked, using cylindrical friction slot and lever.

CONVEYOR DRIER
J. A. Reavell, of London—U.K.808153.

A gas-heated drier conveyor for use in confectionery manufacture, having burners under the top belt run. Patent 760131 is mentioned.

PERMEABLE CONVEYOR
F. L. Smidth & Co., A/S, of Copenhagen—U.K. 808204.

Wet fine solids are preheated before reaching kiln by suspension in exhaust gases penetrating underside of conveyor.

WEB CONVEYOR
Molins Machine Co., Ltd., of Deptford—U.K. 808418.

Improved version of patent 776777 for a suction drum paper conveyor with cutter having numerous hard inserts to reduce wear and noise.